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WELL TEST ANALYSIS FOR NATURALLY-FRACTURED RESERVOIRS

BY

GIOVANNI DA PRAT

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Stanford University, Stanford, California

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To Cristina and Giovanni.

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ABSTRACT

In this work pressure transient analysis for constant rate production and transient rate analysis for constant pressure production are presented for a naturally fractured reservoir. Constant producing pressure solutions, which define declining production rates with time, are presented. The solutions for the dimensionless flowrate and pressure are based on a model presented by Warren and Root (1963). The results obtained for a finite no-flow outer boundary are new and surprising. It was found that the flowrate shows a rapid decline initially, becomes nearly constant for a period, and then a final decline in rate takes place. A striking result of the present study is that ignoring the presence of a constant flowrate period in a type-curve match can lead to erroneous estimates of the dimensionless outer radius of a reservoir.

A method to determine the permeability-thickness product for a naturally-fractured reservoir is presented. The method involves a semilog graph of the pressure difference $\log(\bar{p}-p_{ws})$ vs shut-in time Δt. The mathematical theory is based on the extended Muskat analysis for a homogeneous reservoir. A comparison is made with the Pollard method. It was found that both methods are mathematically related.

The dimensionless matrix pressure and fracture pressure distributions are presented for both the constant rate case and constant pressure production.

Interference tests for the constant rate production can be interpreted at long times using the line-source solution. For the constant pressure

production case, the pressure array from the wellbore does *not* correlate with the line source solution.

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1.0 INTRODUCTION

Naturally fractured reservoirs are heterogeneous porous media wherein the openings (fissures and fractures) vary in size. Fractures and openings of large size form vugs and interconnected channels, whereas the fine cracks form block systems which are the main body of the reservoir (Fig. 1-1). The porous blocks store most of the fluid in the reservoir, and are often of low permeability, whereas the fractures have a low storage capacity and high permeability. Most of the fluid flow will occur through the fissures with the blocks acting as fluid sources. Even though the volumetric average permeability in a two-porosity system is low, such systems often exhibit an effective permeability which is 'higher than the block matrix permeability, and behave differently from ordinary homogeneous media.

These systems have been studied extensively in the petroleum literature. One of the first such studies was published by Pirson in 1953. In 1959, Pollard presented one of the first pressure transient models available for interpretation of well test data from two-porosity systems. The most complete analysis of transient flow in two-porosity systems was presented in 1960 by Barenblatt and Zheltov. The Warren and Root study in 1963 is widely considered to be the forerunner of modern interpretation of two-porosity systems. Their paper has been the subject of study by many authors such as: Odeh (1965), Kazemi, Streltsova-Adams (1976), and Mavor and Cinco-Ley (1979). The behavior of fractured systems has long been a topic of controversy. Warren and Root (1963) and Kazemi (1969) have indicated that the graphical technique proposed by Pollard in 1959

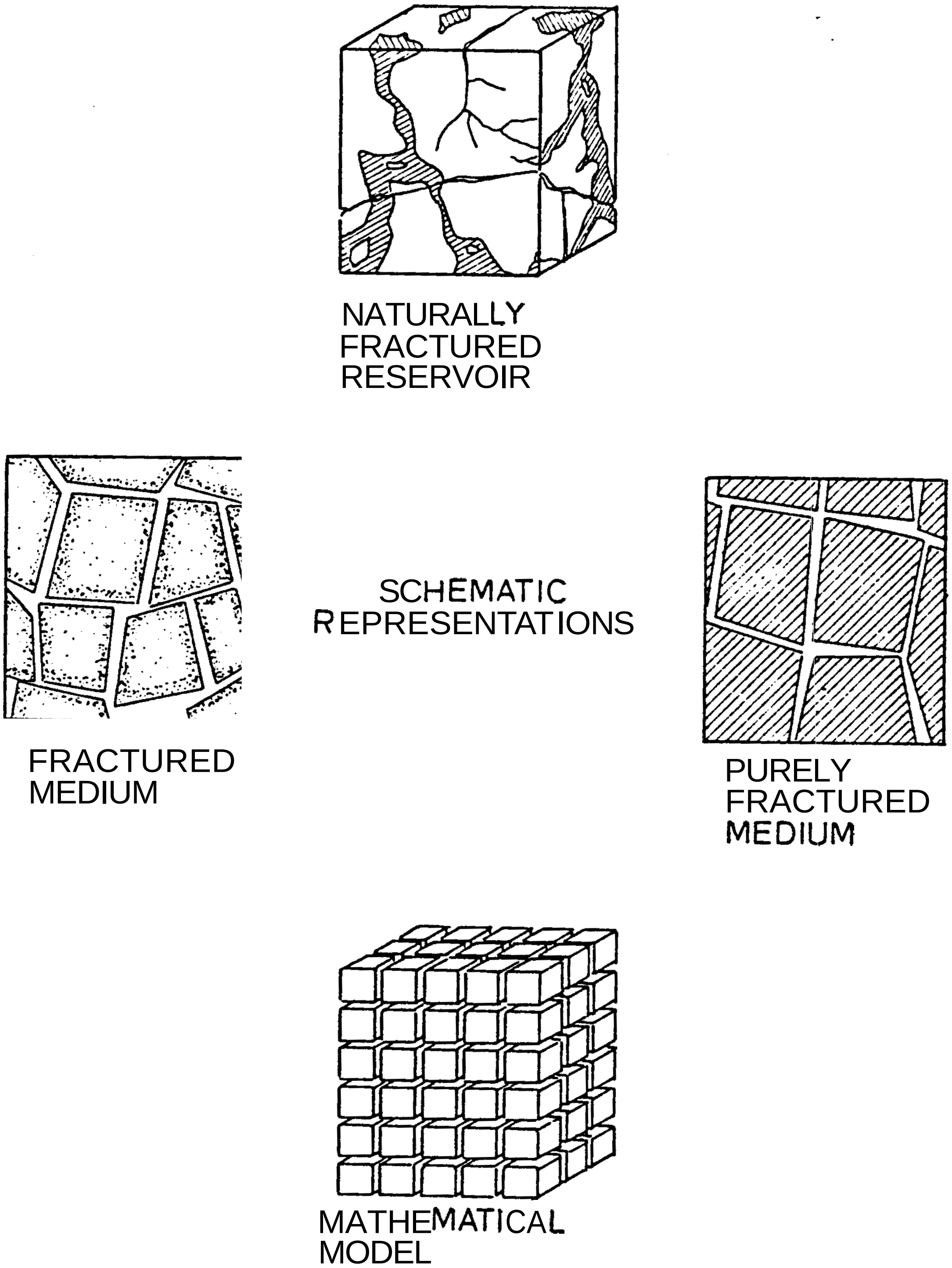

Fig. 1-1: **SCHEMATICS REPRESENTATIONS OF A FRACTURED MEDIUM (after Warren and Root (1963), Streltsova-Adams (1976)**

is susceptible to error caused by approximations in the mathematical model. Nevertheless, the Pollard method is still used. The most complete study of two-porosity systems appears to be the Mavor and Cinco-Ley study in 1979. This study considers wellbore storage and skin effect, and also includes production, both at constant rate and at constant pressure. However, little information is presented concerning the effect of the size of the system on pressure buildup behavior.

Although decline curve analysis is widely used, methods specific for two-porosity, fractured systems do not appear to be available. In Section 2 of this study the constant producing pressure solutions which define declining production rates with time for a naturally fractured reservoir are presented. The results obtained for a finite no-flow outer boundary are new, and surprising. As described in Section 2, it was found that the flowrate shows a rapid decline initially, becomes nearly constant for a substantial period, and then a final decline in rate takes place. A striking result of the present study is discussed in initial decline and production forecast analysis in Section 2. Ignoring the presence of a constant flowrate period in a type-curve match can lead to erroneous estimates of the size of the reservoir.

In Section 3, a new method to determine the permeability-thickness product for a two-porosity system is introduced. A comparison is made with the Pollard method which involves a similar graphical presentation. It was found that both methods are mathematically related. However, because of the inherent assumptions involved in each method, no physical meaning is associated with such a relation.

2.0 TRANSIENT RATE ANALYSIS (CONSTANT PRESSURE PRODUCTION)

Although decline curve analysis is widely used, methods specific to naturally fractured reservoirs do not appear to be available. It is the objective of this section to produce and study decline-curve analysis for a naturally-fractured reservoir. In Section 2.1, the partial differential equations which define the basic problem are given. In Section 2.2, the method used in this work for obtaining solutions to the equations is presented. In Section 2.3, the analytical solutions in Laplace space for both the infinite and the closed outer boundary are given. Included in this section is a short and a long-time analysis which provides simple expressions in real space which verify the numerical algorithm, and appeared to be useful in the interpretation of results. Also included in this section are the evaluation of the parameters ω and λ from decline curves, and a study of the observed initial decline in production rate. It is shown that for naturally-fractured systems, the initial decline in flowrate is not always representative of the final state of depletion. Ignoring this fact could lead to errors in estimation of the size of the system. In Section 2.3.5 a procedure for using log-log type-curve matching for analyzing rate-time data is presented. From the match point, the fracture permeability and the total storativity can be calculated. Finally, Section 2.3.7 contains a study of interference for a well produced at a constant inner pressure. The solutions for both the dimensionless matrix and fracture pressure at the formation are presented.

2.1 PARTIAL DIFFERENTIAL .EQUATIONS

In this section the basic partial differential equations for fluid flow in a two-porosity system are presented. The equations are based on a model originally presented by Warren and Root in 1963. The model was extended recently by Mavor and Cinco-Ley (1979) to include wellbore storage and skin effect. In the present work, the model is extended to study the behavior of the dimensionless flowrate for a well producing at a constant inner pressure from either a finite or an infinite two-porosity system.

The fundamental partial differential equations are:

$$\frac{\partial^2 p_{fD}}{\partial r_D^2} + \frac{1}{r_D}\frac{\partial p_{fD}}{\partial r_D} = (1-\omega)\frac{\partial p_{mD}}{\partial t_D} + \omega\frac{\partial p_{fD}}{\partial t_D} \qquad (2\text{-}1)$$

$$(1-\omega)\frac{\partial p_{mD}}{\partial t_D} = \lambda(p_{fD}-p_{mD}) \qquad (2\text{-}2)$$

where ω and λ are parameters associated with reservoir and fluid properties. ω relates storage of secondary porosity to total storage and is given by:

$$\omega = \frac{(\phi c)_f}{(\phi c)_f + (\phi c)_m} \qquad (2\text{-}3)$$

λ controls the interporosity flow and is given by:

$$\lambda = \alpha \frac{k_m}{k_f} r_w^2 \qquad (2\text{-}4)$$

For the closed outer boundary, the condition is:

$$\left.\frac{\partial p_{fD}}{\partial r_D}\right|_{r_D=r_{eD}} = 0 \qquad (2\text{-}10)$$

The dimensionless flowrate into the wellbore is given by:

$$q_D(t_D) = -\left(\frac{\partial p_D}{\partial r_D}\right)_{r_D=1} \qquad (2\text{-}11)$$

The cumulative production is related to the flowrate by:

$$Q_D = \int_o^{t_D} q_D d_{tD} \qquad (2\text{-}12)$$

The equations presented above define completely the statement of the problem. In the next section the method of solution is described.

2.2 METHOD OF SOLUTION

A common method for solving Eqs. 2-1 through 2-8 is by using the Laplace transformation. The advantages of this method have been described by van Everdingen and Hurst (1949). By this method, the equations are transformed into a system of ordinary differential equations which can be solved analytically. The resulting solution in the transformed space is a function of the Laplace variable, s , and the spatial variable, r_D . To invert the solution to real time and space, the inverse Laplace transformation is used.

α is the interporosity flow shape factor in ft^{-2}. p_{fD} and t_D are defined as:

$$p_{fD} = \frac{k_f h(p_i - p)}{141.2\ q\mu B} \tag{2-5}$$

and

$$t_D = \frac{2.637(10^{-4})k_f t}{[(\phi c)_m + (\phi c)_t]\mu r_w^2} \tag{2-6}$$

A complete mathematical definition requires additional equations which represent the appropriate initial and boundary conditions. For a two-porosity system initially at constant pressure, the initial condition is given by:

$$p_{fD}(r_D,0) = 0 \tag{2-7}$$

The inner boundary condition in thfs case of a constant producing pressure is:

$$p_{fD} - S\left(\frac{\partial p_{fD}}{\partial t_D}\right)_{r_D=1} = 1 \tag{2-8}$$

where S is the skin factor. Two outer boundary conditions are considered: an infinitely large reservoir and a closed outer boundary. For an infinitely large reservoir, the condition is:

$$\lim_{r_D \to \infty} p_{fD}(r_D,t_D) = 0 \tag{2-9}$$

The Laplace transformation is defined by:

$$\overline{F}(S) = \int_o^\infty e^{-st_D} F(t_D)\, dt_D \qquad (2\text{-}13)$$

Applying the Laplace transformation to Eqs. 2-1, 2-2, and Eqs. 2-7 through 2-12 results in the following equations in Laplace space:

$$\frac{d^2\overline{p_{fD}}}{dr_D^2} + \frac{1}{r_D}\frac{d\overline{p_{fD}}}{dr_D} = s(1-\omega)\, \overline{p}_{mD} + s\omega \overline{p}_{fD} \qquad (2\text{-}14)$$

$$s(1-\omega)\, \overline{p}_{mD} = \lambda(\overline{p}_{fD}-\overline{p}_{mD}) \qquad (2\text{-}15)$$

$$\frac{1}{s} = \left(\overline{p}_{fD} - S\frac{\partial\overline{p}_{fD}}{\partial r_D}\right)_{r_D=1} \qquad (2\text{-}16)$$

$$\lim_{r_D\to\infty} \overline{p}_{fD}\,(r_D,s) = 0 \qquad (2\text{-}17)$$

$$\frac{\partial\overline{p}_{fD}}{\partial r_D}\,(r_{eD},s) = 0 \qquad (2\text{-}18)$$

$$\overline{q}_D(s) = \left(\frac{d\overline{p}_D}{dr_D}\right)_{r_D=1} \qquad (2\text{-}19)$$

$$s\overline{Q}_D = \overline{q}_D \qquad (2\text{-}20)$$

The solutions for the dimensionless flowrate, $\overline{q}_D$, and the dimensionless pressure, $\overline{p}_{fD}$, are given in Table 2-1. For $\omega = 1$ and $S = 0$, the

Table **2-1:** LAPLACE SPACE SOLUTIONS FOR A WELL PRODUCING AT A CONSTANT PRESSURE FROM THE CENTER OF A CIRCULAR, NATURALLY-FRACTURED RESERVOIR

INFINITE OUTER BOUNDARY

$$\bar{q}_D(s) = \frac{\sqrt{sf(s)}\, K_1\left(\sqrt{sf(s)}\right)}{s\left[K_0\left(\sqrt{sf(s)}\right) + S\, K_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)}\right]}$$

$$\bar{p}_D(r_D, s) = \frac{K_0\left(\sqrt{sf(s)}\, r_D\right)}{s\left[K_0\left(\sqrt{sf(s)}\right) + S\sqrt{sf(s)}\, K_1\left(\sqrt{sf(s)}\right)\right]}$$

CLOSED OUTER BOUNDARY

$$\bar{q}_D(s) = \frac{\sqrt{sf(s)}\left[I_1\left(\sqrt{sf(s)}\, r_{eD}\right) K_1\left(\sqrt{sf(s)}\right) - K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right)\right]}{s\left\{K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_0\left(\sqrt{sf(s)}\right) + I_1\left(\sqrt{sf(s)}\, r_{eD}\right) K_0\left(\sqrt{sf(s)}\right) - \sqrt{sf(s)}\, S\left[K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right) - K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)\right]\right\}}$$

where

$$f(s) = \frac{\omega(1-\omega)s + \lambda}{(1-\omega)s + \lambda}$$

s = Laplace space variable

S = **skin** effect

solutions are the same as for those for a homogeneous system, as presented by van Everdingen and Hurst (1949).

To get the solution in time, the inverse Laplace transformation should be applied. This can be done in several ways. The simplest method is to find the function and its inverse in well-known tables of Laplace transforms (see, for example, Abramowitz and Stegun, 1970). If the function is not tabulated, then the inverse can be obtained using the Mellin inversion integral:

$$f(t_D) = \frac{1}{2\pi i} \int_{\gamma - i\infty}^{\gamma + i\infty} e^{st} F(s)ds \qquad (2\text{-}21)$$

Another approach to finding the inverse is to use an algorithm for approximate numerical inversion of the Laplace transform solution. Such an algorithm has been presented by Stehfest (1970). The algorithm is based on the formula:

$$f(t_D) = \frac{\ln 2}{t_D} \sum_{i=1}^{N} V_i \, F\left(\frac{\ln 2}{t_D} i\right) \qquad (2\text{-}22\text{-}A)$$

where

$$V_i = (-1)^{[N/2 + 1]} \sum_{k=\frac{i+1}{2}}^{\min(i,N/2)} \frac{k^{N/2}(2k)!}{[(N/2)-k]!\,k!\,(k-1)!\,(i-k)!\,(2k-i)!}$$

(2-22-B)

In Eq. 2-22-B, N, the number of terms in the sum may be determined by comparison with known analytical solutions.

In the present work, the solutions were obtained using the Stehfest numerical algorithm. The algorithm has been used with success in the past by many authors, Mavor and Cinco-Ley (1979), and Sandal and Ramey (1978). The solutions for $w = 1$ (the homogeneous case) are verified whenever possible with results published in the literature. In addition, small-time and long-time approximations were found, which provide analytical expressions to verify the algorithm in cases where $w \neq 1$, i.e., a two-porosity system.

2.3 TRANSIENT RATE SOLUTIONS

Two types of two-porosity systems are considered: the unbounded reservoir and the closed, bounded reservoir. The solutions for the unbounded two-porosity system have appeared elsewhere in the literature (Mavor and Cinco-Ley, 1979). The solutions for the bounded, closed system are new, and are the main objective of this study. For each type of reservoir, short-time and long-time approximations are done on the corresponding expressions for the dimensionless flowrate in Laplace space. The inverse of the resulting functions has appeared in tables of Laplace transforms (Abramowitz and Stegun, 1970). The results provide a check on the validity of the numerical inversion algorithm, and appear to be useful in the interpretation of the observed results.

2.3.1 INFINITE OUTER BOUNDARY

The transient rate solutions for an infinite reservoir reflect the behavior before outer drainage boundary effects are evident. The solution in Laplace space is given by:

$$\bar{q}_D(s) = \frac{\sqrt{sf(s)}\, K_1\left(\sqrt{sf(s)}\right)}{s\left[K_0\left(\sqrt{sf(s)}\right) + s\sqrt{sf(s)}\; K_1\left(\sqrt{sf(s)}\right)\right]} \tag{2-23}$$

(See Table 2-1.) The solution in real space is obtained by numerically inverting Eq. 2-23. Figure 2.1 shows the solution for different values of λ and ω, assuming zero skin effect. For a given λ ($\neq 0$), the flowrate depends initially on t_D and ω. As time increases, the interaction between the matrix and fractures is reflected in a period of constant flowrate after which the solution becomes the same as that for a homogeneous infinite reservoir. Equation 2-23 can be approximated in the limit for both small and long times. This will provide simple expressions for the flowrate that can be used to understand the observed behavior. For small times, as shown in Appendix B, the expression for the flowrate, q_D, is given by:

$$q_D = \frac{\sqrt{\pi}}{\pi}\left(\frac{t_D}{\omega}\right)^{-1/2} \tag{2-24}$$

or, in terms of cumulative production, Q_D,

$$Q_D(t_D) = \frac{2\sqrt{\pi}}{\pi}(\omega t_D)^{1/2} \tag{2-25}$$

For $\omega = 1$, Eq. **2-25** is identical *to* Eq. *34*, presented by van Everdingen and Hurst (1949). The expression obtained for the flowrate can be associated to **a** homogeneous reservoir with an effective time $t'_D = t_D/\omega$. In fact, from the definition of t_D:

$$t'_D = \frac{t_D}{\omega} = \frac{2.637(10^{-4})\, k_f t}{\phi_f c_f \mu r_w^2} \tag{2-26}$$

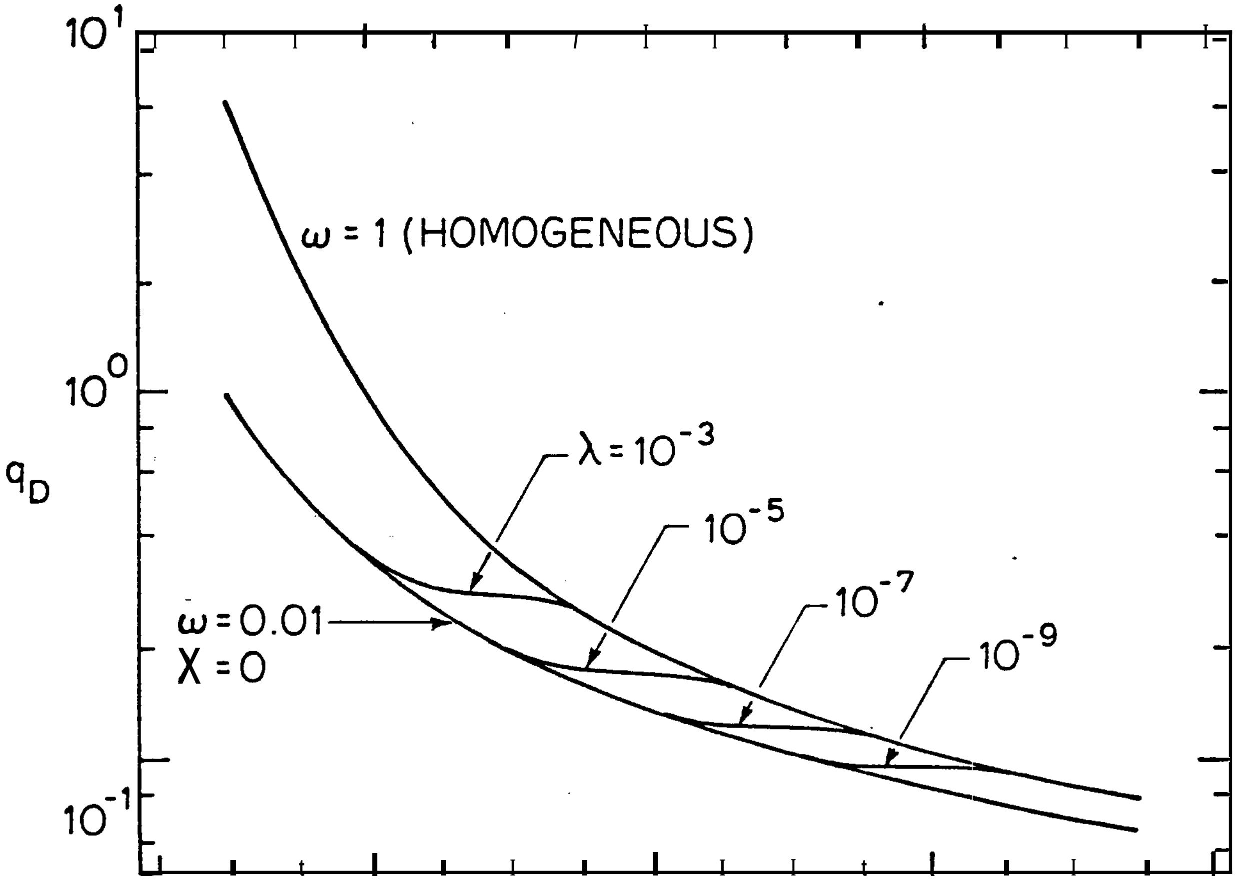

Fig. 2-1: DIMENSIONLESS FLOWRATE FOR CONSTANT PRESSURE PRODUCTION--UNBOUNDED RESERVOIR--EFFECT OF DIFFERENT MATRIX--FRACTURE PERMEABILITY RATIO (λ)

Thus a two-porosity system in an infinite medium does not initially detect the presence of the primary porosity; it behaves like a homogeneous reservoir. For a noncommunicating matrix $(\lambda = 0)$, the solution depends on t_D/ω for all times, as shown in Fig. 2-2. Several curves are shown, depending on the degree of fracture storativity, ω. Actually, all are the same curve, but shifted in time. Thus a graph of q_D versus t_D/ω should produce a single line.

It is seen in Fig. 2-1 that for a given λ, the solution approaches the homogeneous case at long times. The bigger the λ, the sooner the transition. The solution depends on t_D for long times. This can be derived making a long-time approximation for Eq. 2-23. As derived in Appendix B, the solution obtained (valid for long times) is given by:

$$q_D = \frac{2}{\ell n\, t_D + 0.80907} \tag{2-27}$$

which is the solution for a homogeneous reservoir, as given by Jacob and Lohmann (1952).

2.3.2 CLOSED OUTER BOUNDARY

The behavior of a homogeneous, closed-outer-boundary reservoir has been studied by many authors. van Everdingen and Hurst (1949) presented the solution for the cumulative flowrate for the constant terminal pressure case. Fetkovich (1980) discussed the Tsarevich and Kuranov (1958) finding that exponential decline is a long-time solution of the constant pressure case. Exponential rate decline should also follow a pseudosteady-state period for the constant-rate case when producing pressure finally reaches some limiting value such as line pressure, or atmospheric pressure.

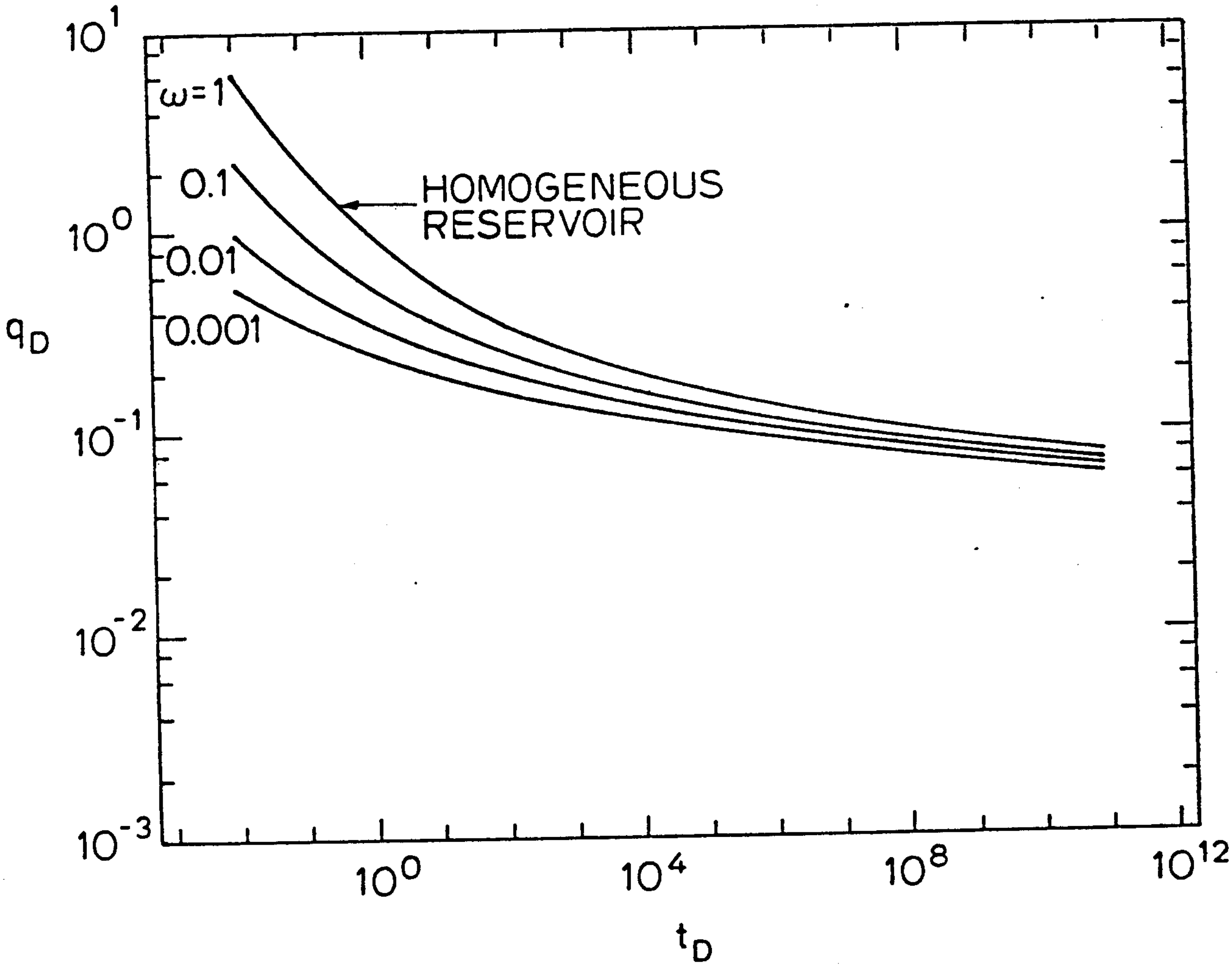

Fig. 2-2: **DIMENSIONLESS FLOWRATE FOR CONSTANT PRESSURE PRODUCTION--LIMITING FORMS FOR A TWO-POROSITY SYSTEM--UNBOUNDED RESERVOIR, NON-COMMUNICATING MATRIX ($\lambda = 0$)**

For a naturally-fractyred system, it appears that the behavior of the flowrate for a constant producing pressure well has not been studied. This is the objective of this section.

The solution for the dimensionless flowrate, q_D , in Laplace space is given by:

$$\bar{q}_D = \frac{\sqrt{sf(s)}\left[I_1\left(\sqrt{sf(s)}\, r_{eD}\right) K_1\left(\sqrt{sf(s)}\right) - K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right)\right]}{s\left\{\left[K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_0\left(\sqrt{sf(s)}\right) + I_1\left(\sqrt{sf(s)}\, r_{eD}\right) K_0\left(\sqrt{sf(s)}\right)\right] - \sqrt{sf(s)}\; s\left[K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right) - K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)\right]\right\}} \tag{2-28}$$

The solution for q_D in real space may be obtained by the inverse Laplace transformation. This is done by using the Stehfest numerical algorithm. The solution for $r_{eD} = 50$, and several values of ω and λ is shown in Fig. 2-3. The results are surprising: the flowrate shows a rapid decline at first, and then the flowrate becomes almost constant for a long period, after which a final rate decline takes place. The long period of constant rate has not been reported before, and is a major finding of this study. For small times, the flowrate depends on t_D and ω , but for long times it depends on t_D , ω , λ , and r_{eD} . Compared to the homogeneous case ($\omega = 1$), a long time is required to deplete a two-porosity system. The value of the flowrate during the constant rate period depends strongly on the matrix-to-fracture permeability ratio, λ .

Fetkovich (1980) observed that for homogeneous systems at the onset of depletion (a type of pseudosteady-state) all solutions for various

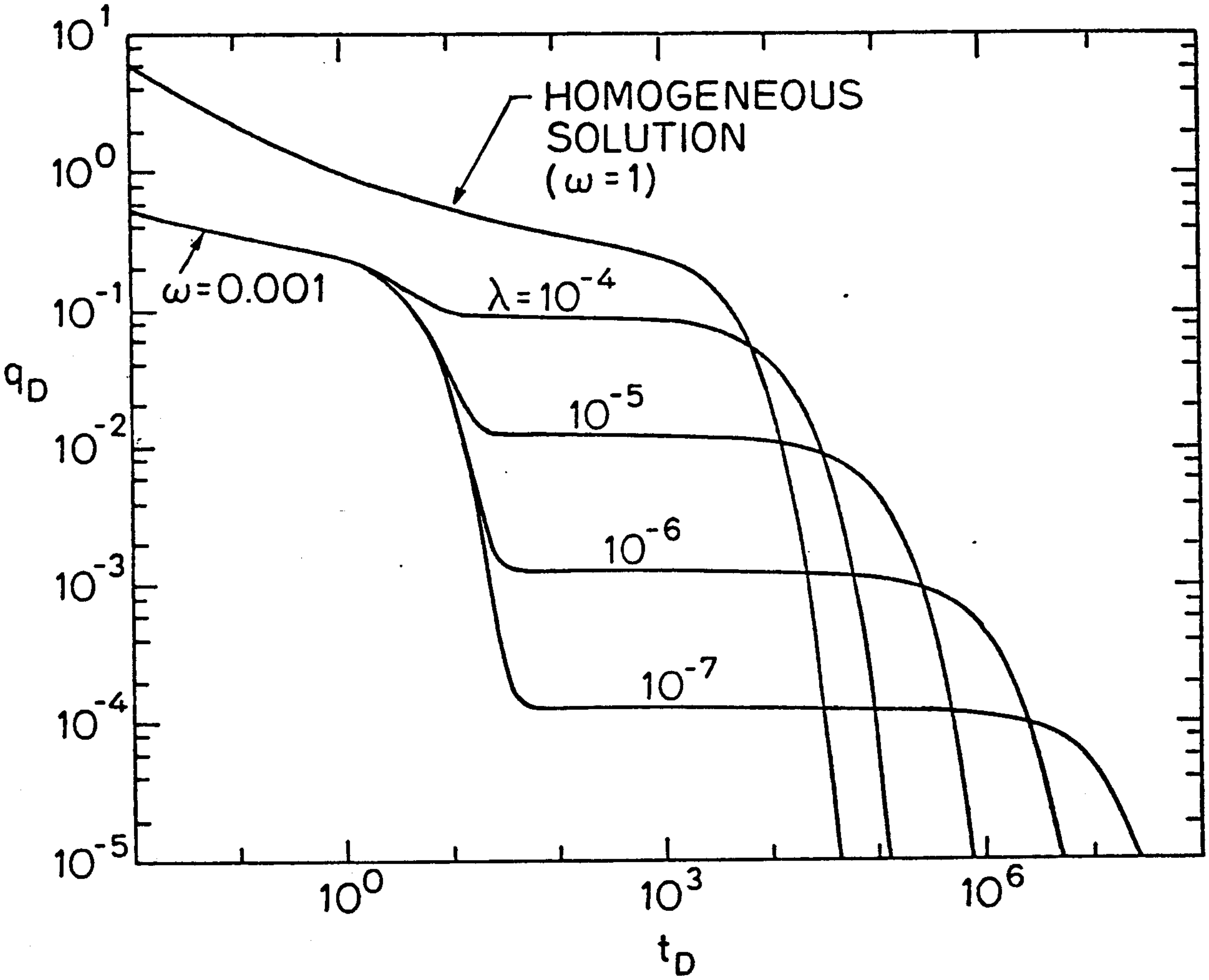

Fig. 2-3: q_D VS t_D FOR CONSTANT PRESSURE PRODUCTION; **CLOSED** BOUNDARY (r_{eD} = 50, **skin effect** = 0)

various values of r_{eD} develop exponential rate decline, and converge to a single curve as shown in Fig. 2-4. This statement is not true for two-porosity systems. Figure 2-5 is a graph of $q_D(\ln r_{eD} - 3/4)$ vs $t_{AD}/(\ln r_{eD} - 3/4)$ for $\omega = 0.01$, $\lambda = 10^{-6}$ and several values of r_{eD}. It can be seen that the solutions do not converge to a single curve.

To explain the observed behavior, short- and long-time approximations of Eq. 2-28 may be found. These approximations will provide simple expressions for the flowrate and the cumulative production, as shown in the next two sections.

2.3.2.1 Short-Time Analysis

For short times, q_D depends on ω and t_D, as seen in Fig. 2-3. As for the homogeneous system, there is no dependence on r_{eD} for small times. The system behaves as an infinite medium. A solution to Eq. 2-28 valid for small times can be obtained by substituting the modified Bessel functions by their asymptotic expansions. Because of the relation between s and t_D, when s is large, t_D is small, i.e., as $s \to \infty$, $t_D \to 0$. The following relations are valid for large values of the argument:

$$I_1(z) = I_0(z) \sim \frac{e^z}{\sqrt{2\pi z}} \qquad (2-29)$$

$$K_0(z) = K_1(z) \sim \frac{\pi}{2z} \; e^{-z} \qquad (2-30)$$

As shown in Appendix B, substituting Eqs. 2-29 and 2-30 in Eq. 2-28, assuming zero skin effect and inverting, the following expressions are obtained for q_D and Q_D :

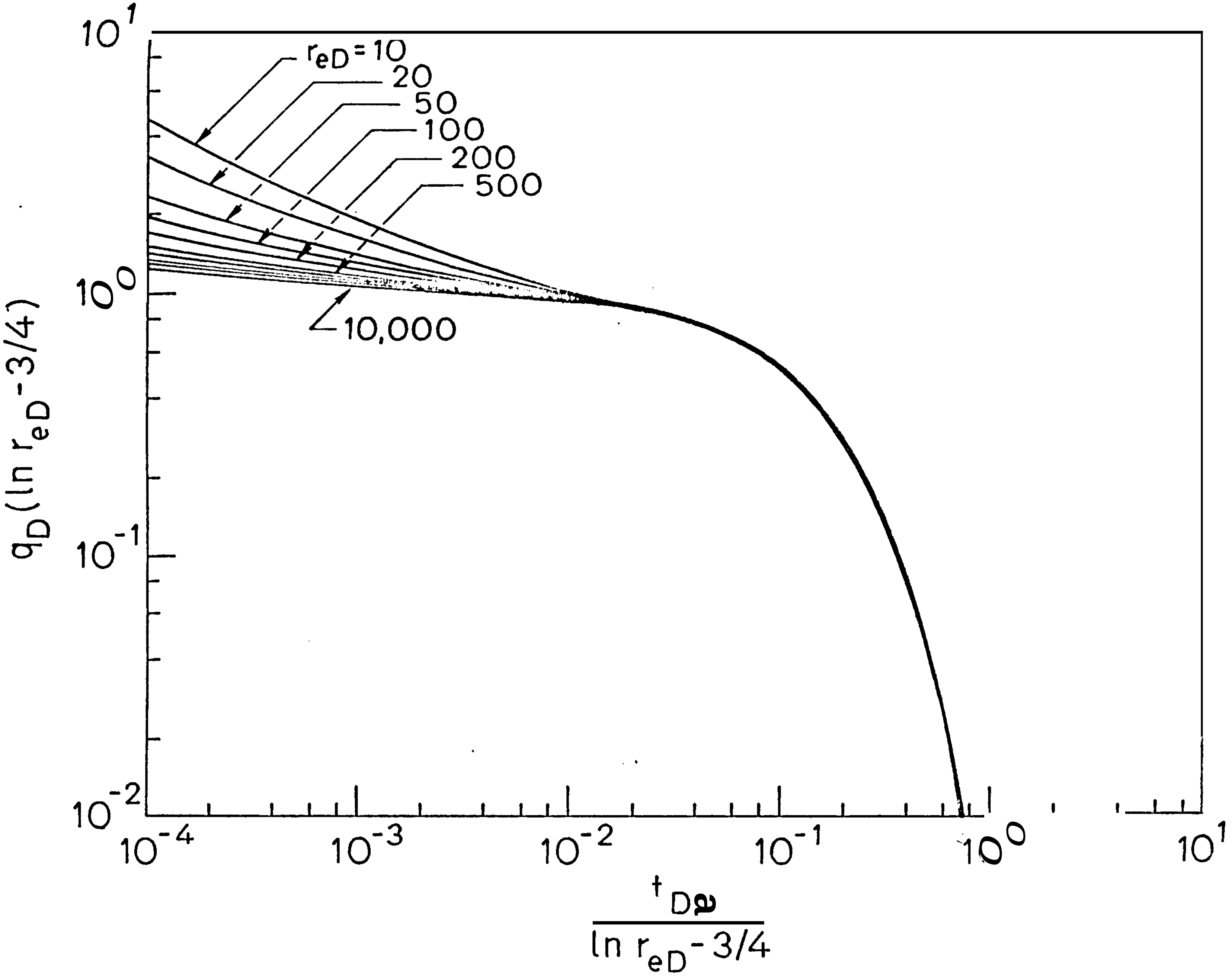

Fig. 2-4: DIMENSIONLESS FLOWRATE FUNCTIONS FOR A WELL PRODUCED AT A CONSTANT PRESSURE FROM A HOMOGENEOUS RESERVOIR ($\omega = 1$)

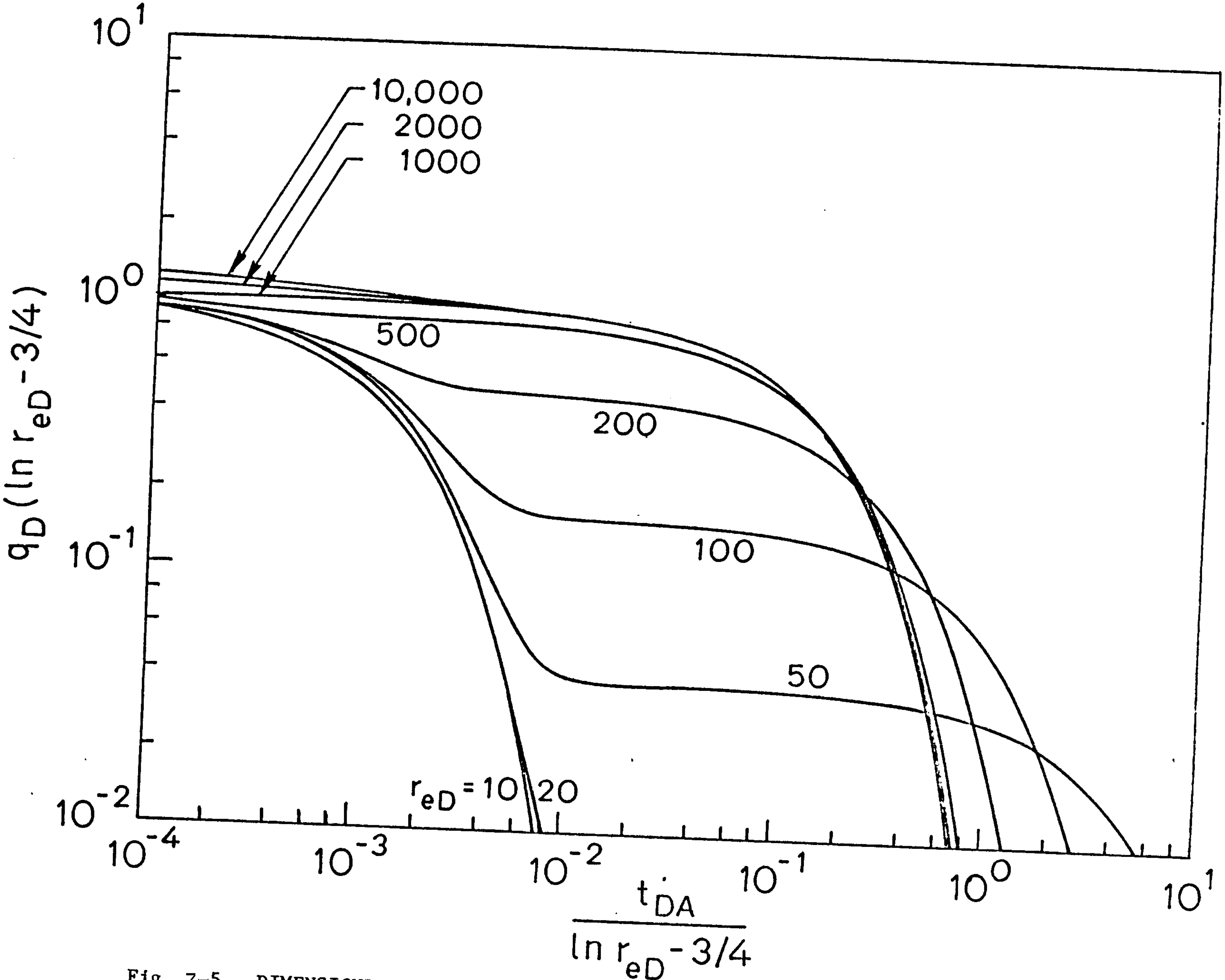

Fig Z-5: DIMENSIONLESS FLOWRATE FUNCTIONS FOR A WELL PRODUCED AT A CONSTANT PRESSURE FROM A TWO-POROSITY SYSTEM ($\omega = 0.01$, $\lambda = 10$[illegible])

$$q_D = \frac{\sqrt{\pi}}{\pi} \left(\frac{t_D}{\omega} \right)^{-1/2} \tag{2-31}$$

$$Q_D = \frac{2\sqrt{\pi}}{\pi} (\omega t_D)^{1/2} \tag{2-32}$$

If $\omega = 1$, Eq. 2-32 is identical to Eq. 30 presented by van Everdingen and Hurst (1949) for a well in an infinite system. In fact, the same conclusions obtained for the infinite case in the preceding section can be applied here: mainly that the dependence of q_D is on t_D/ω at short times.

2.3.2.2 Long-Time Analysis

A long-time approximation for q_D or Q_D is obtained by substituting the modified Bessel function in Eq. 2-28 for expressions valid for small values of the argument:

$$K_0(z) = -(\ln \frac{z}{2} + \gamma) \tag{2-33}$$

$$K_1(z) = 1/z \tag{2-34}$$

$$I_0(z) = 1 + \frac{1}{4} z^2 \tag{2-35}$$

$$I_1(z) = \frac{1}{2} z + \frac{1}{8} z^3 \tag{2-36}$$

As shown in Appendix B, substituting Eqs. 2-33 through 2-36 and inverting yields, for the flowrate:

$$q_D(t_D) = \left(\frac{r_{eD}^2 - 1}{2} \right) \lambda \, e^{-\frac{\lambda}{1-\omega} t_D} \tag{2-37}$$

and:

$$Q_D(t_D) = \frac{r_{eD}^2 - 1}{2}\left[(\omega-1)\, e^{-\frac{\lambda t_D}{1-\omega}} + 1\right] \qquad (2\text{-}38)$$

for the cumulative production,

Figure 2-6 shows the solution for q_D obtained numerically, and the solution given by Eq. 2-37. At long times, both solutions agree.

From Eq. 2-37 for long times, exponential decline can be seen to be the solution of the constant producing pressure case. Thus a known result for homogeneous systems can be extended to two-porosity systems. However, in a two-porosity system, the final decline takes place later in time, compared to the homogeneous case ($\omega = 1$). That is, it takes a longer time to deplete a fractured system. This can be explained using Eq. 2-37. The equation should represent the homogeneous solution when either $\omega = 1$ or $\lambda \to \infty$. Taking the limit yields:

$$\lim_{\substack{\lambda\to\infty \\ \text{or} \\ \omega\to 1}} q_D = \lim_{\substack{\lambda\to\infty \\ \text{or} \\ \omega\to 1}} \left(\frac{r_{eD}^2 - 1}{2}\right) \times e^{-\frac{\lambda}{1-\omega} t_D} = 0 \qquad (2\text{-}39)$$

From Eq. 2-39 for a homogeneous system, the flowrate is zero, a well-known result for long times. However, the cumulative production is the same as that for a homogeneous system at long times:

$$\lim_{t_D\to\infty} Q_D(t_D) = \frac{r_{eD}^2 - 1}{2} \qquad (2\text{-}40)$$

This is shown in Fig. 2-7.

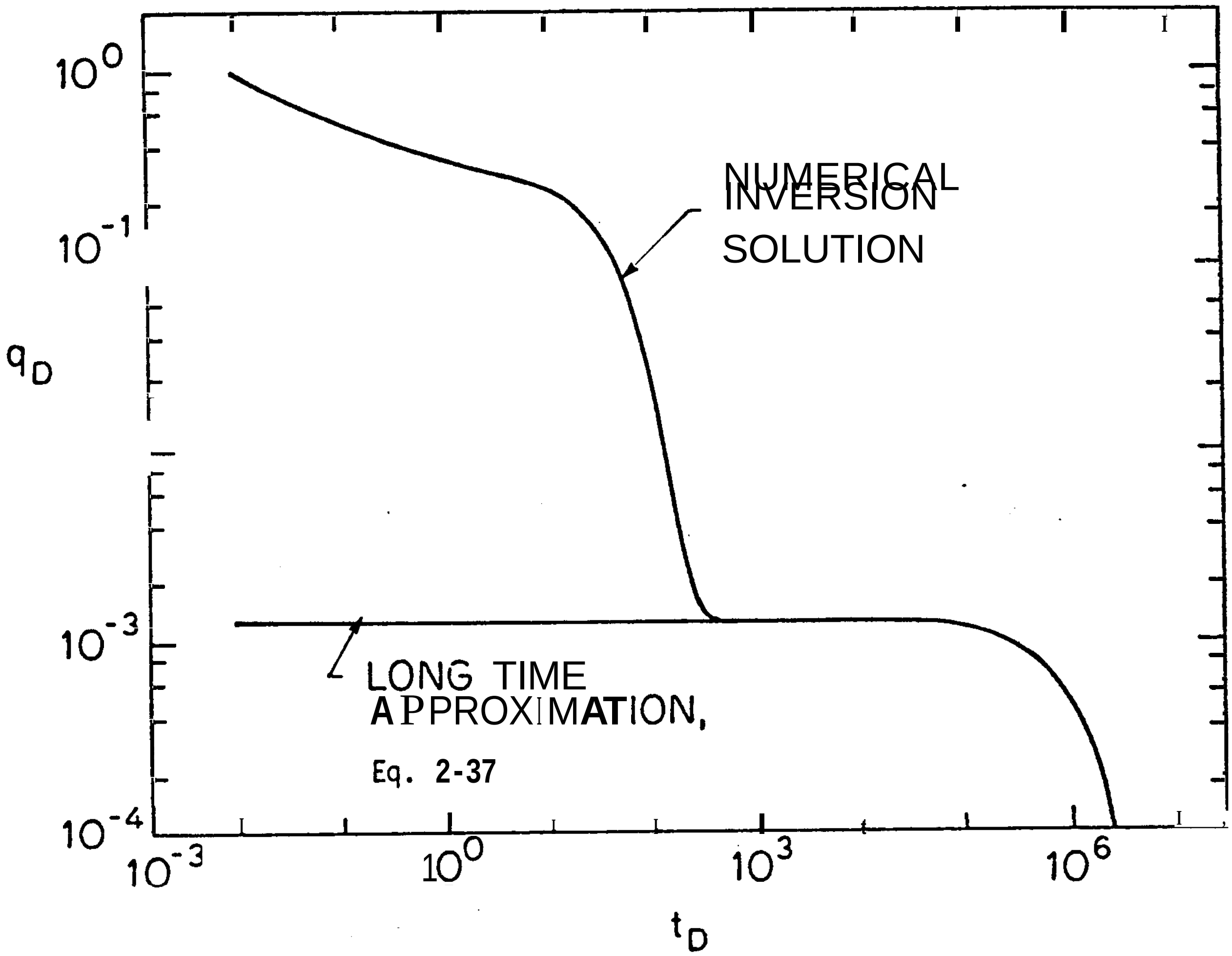

Fig. 2-6: q_D VS t_D NUMERICAL, AND LONG-TIME APPROXIMATION
(ω = 0.01, $\lambda = 10^{-6}$, r_{eD} = 50, skin effect = 0)

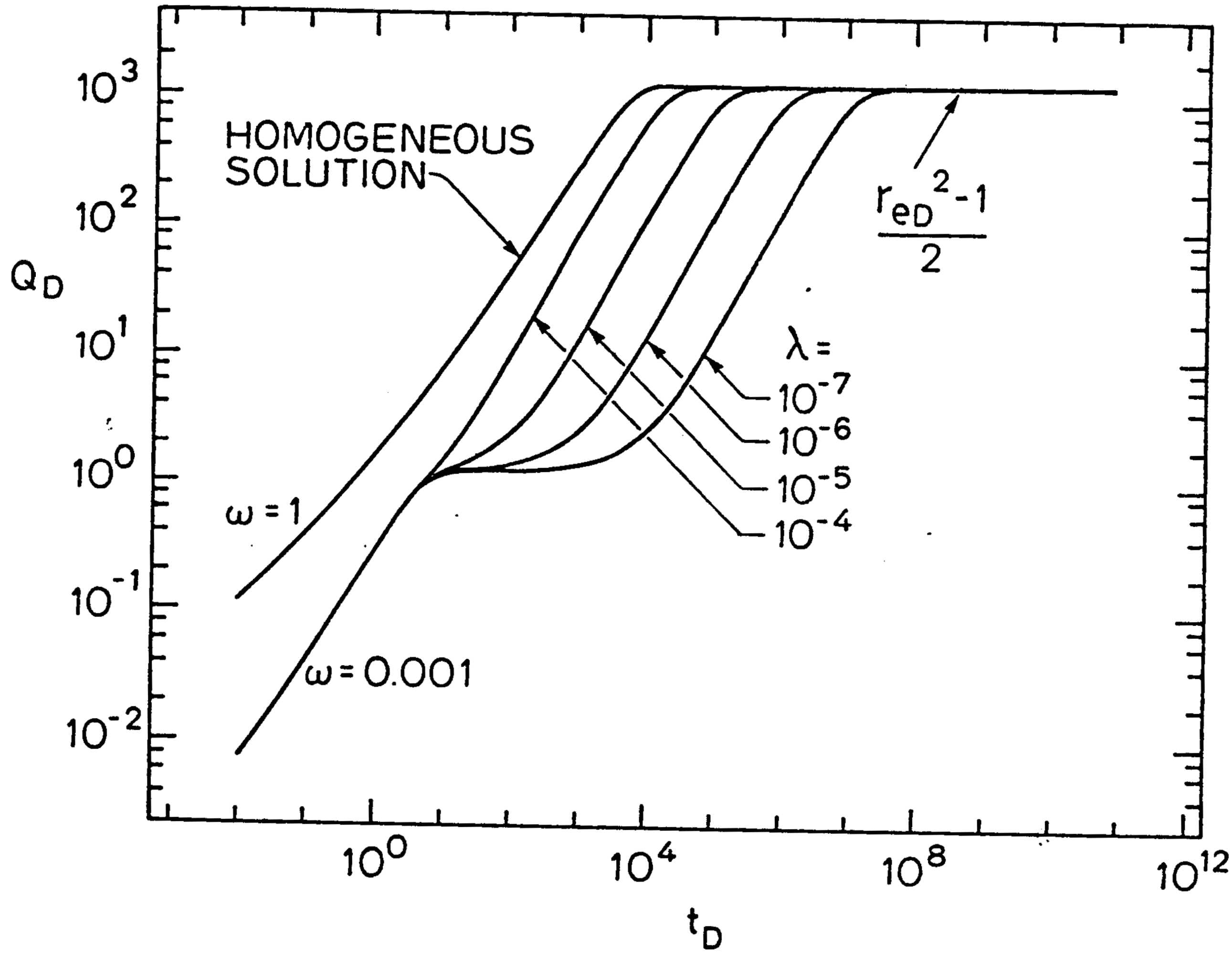

Fig. 2-7: Q_D VS t_D **FOR A** CLOSED BOUNDARY (r_{eD} = 50, **skin** effect = 0)

The long-time solution can be used to explain the observed period of constant flowrate. This is done by identifying terms in the expression for q_D :

$$q_D = \frac{r_{eD}^2-1}{2} \lambda e^{-\frac{\lambda}{1-\omega} t_D} \qquad (2\text{-}41)$$

The series expansion for the exponential is:

$$e^{-x} = 1 - \frac{x}{1!} + \frac{x^2}{2!} - \frac{x^3}{3!} + \cdots \qquad (2\text{-}42)$$

If x is small, then $e^{-x} \sim 1$. Then we can say that for $\frac{\lambda t_D}{1-\omega} \ll 1$,

$$q_D(t_D) = \frac{r_{eD}^2-1}{2} \qquad (2\text{-}43)$$

Equation 2-43 holds as long as $\lambda t_D \ll (1-\omega)$, or $t_D \ll \frac{1-\omega}{\lambda}$. For $t_D = \frac{1-\omega}{\lambda}$:

$$q_D = 0.37 \frac{r_{eD}^2-1}{2} \lambda \qquad (2\text{-}44)$$

As time increases, the exponential term in Eq. 2-37 begins to dominate until the flowrate becomes zero.

2.3.3 EVALUATION OF ω AND λ FROM DECLINE CURVES

Warren and Root (1963), Uldrich and Ershaghi (1978), and others have described a method to find the dimensionless matrix fracture permeability ratio, λ , and the dimensionless fracture storage, ω , from pressure buildup analysis. It was also observed that there are cases where the evaluation of these parameters is difficult, especially when early time pressure data is missing or influenced by wellbore storage.

In this section, we show the possibility of evaluating ω and λ using values for the dimensionless flowrate at long times.

For long times, the flowrate is given by Eq. *2-37:*

$$q_D(t_D) = \left(\frac{r_{eD}^2-1}{2}\right)\lambda \; e^{-\frac{\lambda}{1-\omega} t} \tag{2-37}$$

Taking logarithms of both sides of Eq. *2-37* yields:

$$\ln q_D = \ln \left(\frac{r_{eD}^2-1}{2}\right)\lambda - \frac{\lambda}{1-\omega} t \tag{2-44}$$

Thus a graph of $\ln q_D$ versus t_D should produce a straight line, as shown in Fig. *2-8.* The slope, m_D , is given by:

$$|m_D| = \frac{\lambda}{1-\omega} \tag{2-45}$$

and the intercept is given by:

$$q_D = \lambda\left(\frac{r_{eD}^2-1}{2}\right) \tag{2-46}$$

Thus λ may be found using Eq. *2-46,* and w from Eq. 2-45. Therefore. providing r_{eD} is known, ω and A can be obtained from long-time data. However, the method is limited from a practical viewpoint. Long-time production data may require that the system be nearly depleted. Thus detection of w and λ in this manner could provide a good forecast of the past.

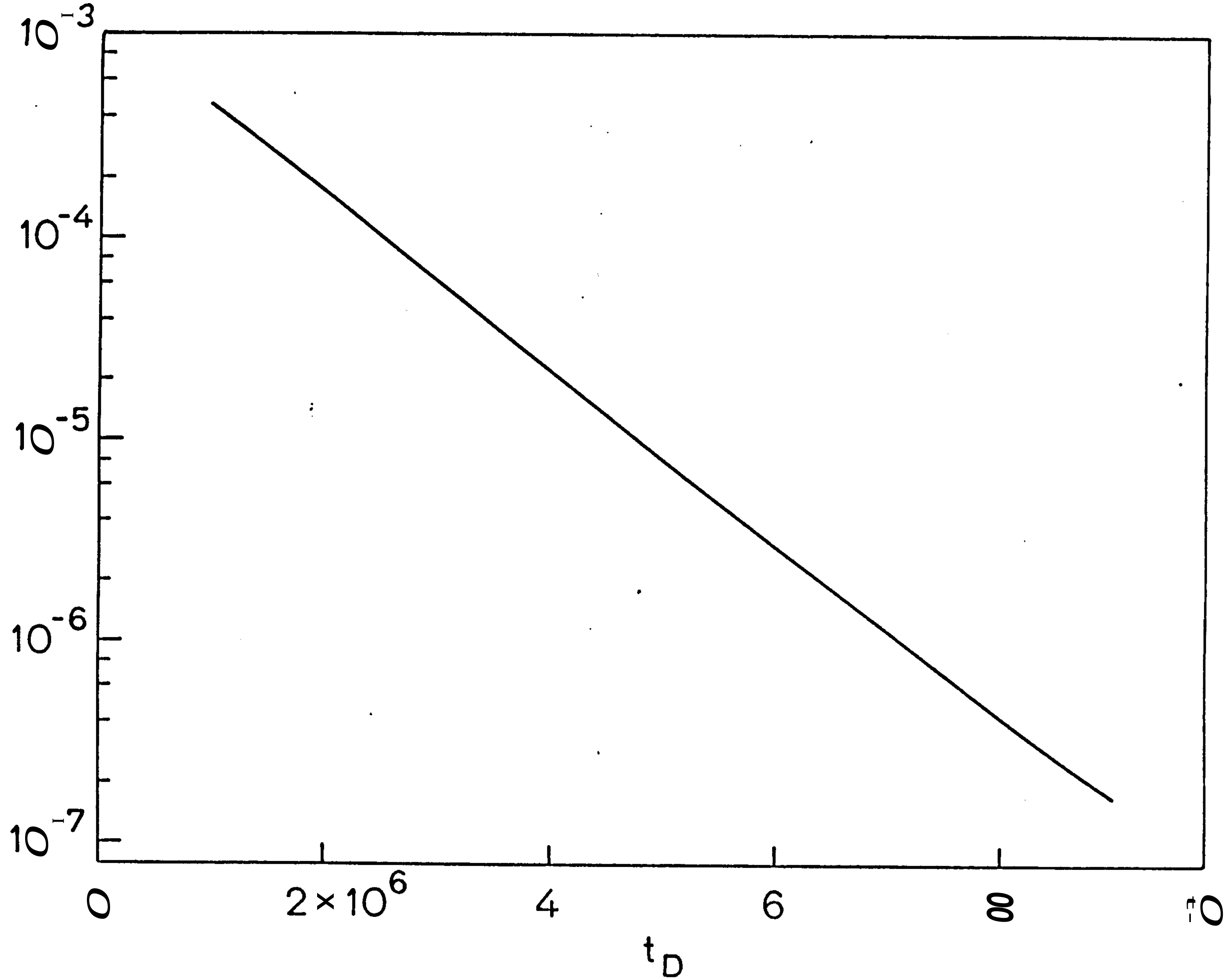

Fig 2-8: DIMENSIONLESS FLOWRATE FOR CONSTANT PRESSURE PRODUCTION FROM A TWO-POROSITY SYSTEM, LATE TIME DATA (r_{eD} = 50, skin effect = 0, ω = 0.01, $\lambda = 10^{-6}$)

2.3.4 INITIAL DECLINE AND PRODUCTION FORECAST ANALYSIS

In this section the observed initial decline in flowrate is studied in more detail. From an engineering and economic point of view, the initial decline could be a key factor in the completion or abandonment of a well. In the case of a homogeneous system, this decline is the only one observed; but for two-porosity systems, as shown in previous sections, the initial decline is not always the final state of depletion.

The objective of this section is to show that decisions concerning production forecast and estimates of the size of the reservoir in a two-porosity system should not be based only on the observed initial decline. For instance, let us take the case of $\omega = 0.001$ and $\lambda = 10^{-6}$. The dimensionless flowrate behavior is shown in Fig. 2-3. Based only on the initial decline and, considering a homogeneous system, we are dealing with a reservoir of a dimensionless outer radius r_{eD} less than 5. (This can be seen by graphing the solution on the type-curve presented by Fetkovich (1980) as Fig. 2A.) The final cumulative production should be 12. In reality, based on previous analysis, the system size r_{eD} is 50 and the final cumulative production is 1250. Thus, ignoring the presence of a two-porosity system can lead to an error of 90% in r_{eD} and 99% in Q.

Let us start the analysis of the initial decline by considering the simplest case of a noncommunicating matrix, $\lambda = 0$. In this case, the behavior is the same as that for a homogeneous system, but with $t_D' = t_D/\omega$. Fig. 2-9 shows the dimensionless flowrate behavior q_D versus t_D for different values of storativity ω. All curves show one well defined decline as the final depletion state. An expression for q_D can be derived in this case. For homogeneous systems, the exponential depletion state can be derived from the dimensionless wellbore pressure function

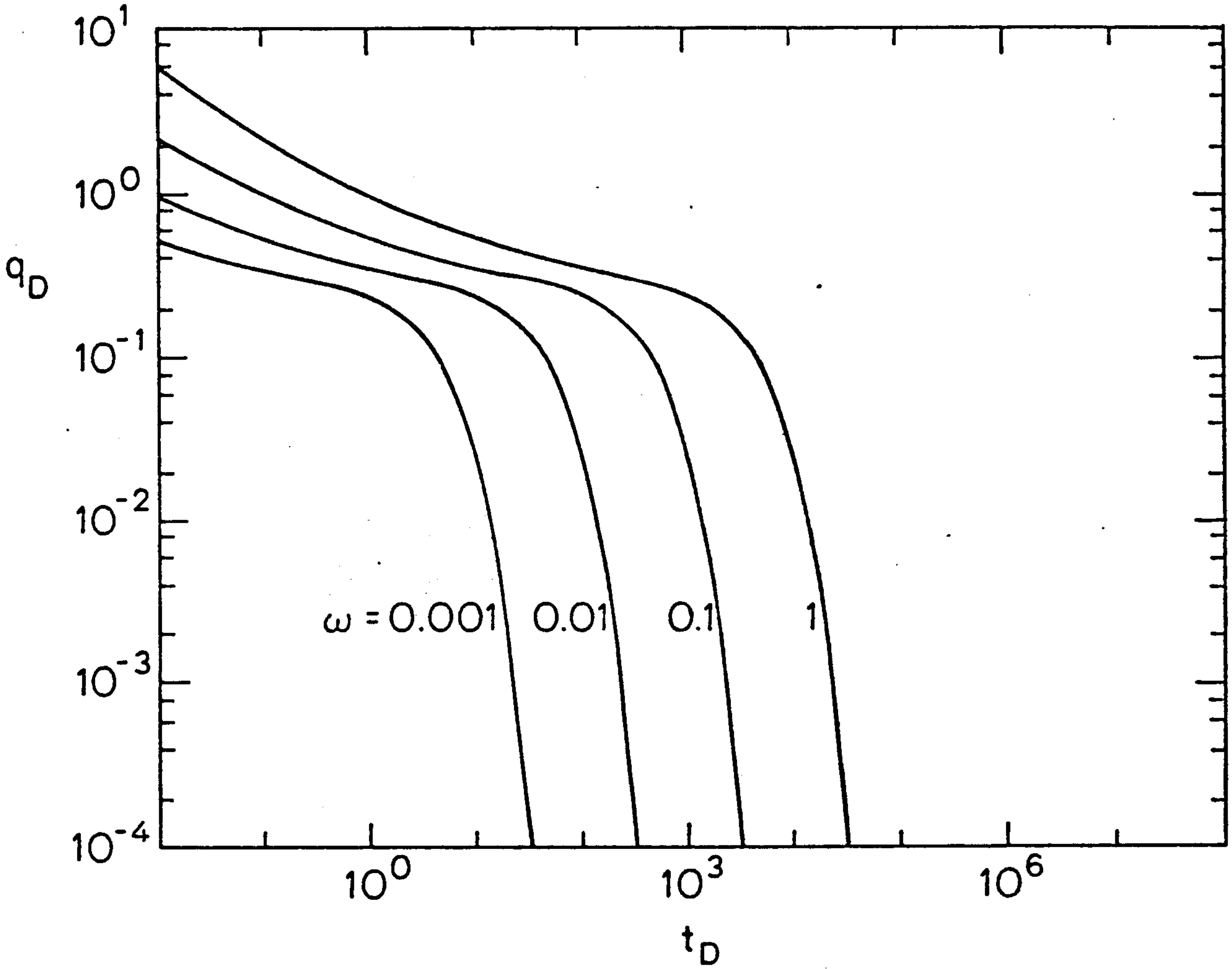

Fig. 2-9: q_D VS t_D FOR DIFFERENT VALUES OF ω
($r_{\epsilon D}$ = 50, λ = 0, and skin effect = 0)

for constant rate production after the onset of pseudosteady-state. van Everdingen and Hurst (1949) showed that q_D and p_{wD} are related in Laplace space by:

$$\bar{q}_D = \frac{1}{s^2 \bar{p}_{wD}} \qquad (2\text{-}47)$$

Therefore, knowing $\bar{p}_{wD}$ at constant rate, it is possible to find q_D by applying the inverse Laplace transformation to Eq. 2-47. Mavor and Cinco-Ley (1979) showed that for a closed, bounded two-porosity system, p_{wD} is given by:

$$p_{wD} = 2\pi\left(\frac{t_{AD}}{\omega}\right) + \frac{1}{2}\ln\left(\frac{2.2458A}{C_A r_w^2}\right) \qquad (2\text{-}48)$$

This expression is valid for $\frac{t_{AD}}{\omega} \geq 0.1$, and $\lambda = 0$.

For a bounded, circular reservoir, the Laplace transform of Eq. 2-48 is:

$$\bar{p}_{wD} = \frac{2}{\omega r_{eD}^2 s^2} + \frac{1}{s}(\ln r_{eD} - 3/4) \qquad (2\text{-}49)$$

Substituting this expression into Eq. 2-47 and inverting yields:

$$q_D = \frac{1}{(\ln r_{eD} - 3/4)} \exp\left(-\frac{2}{r_{eD}^2(\ln r_{eD} - 3/4)}\frac{t_D}{\omega}\right) \qquad (2\text{-}50)$$

Figure 2-10 shows the solution given by the numerical algorithm and the one using Eq. 2-50 for the case $w = 0.01$, and $\lambda = 0$. Both solutions are the same after $t_D \geq \omega\, 0.1 \pi r_{eD}^2$. Therefore, in the case of a

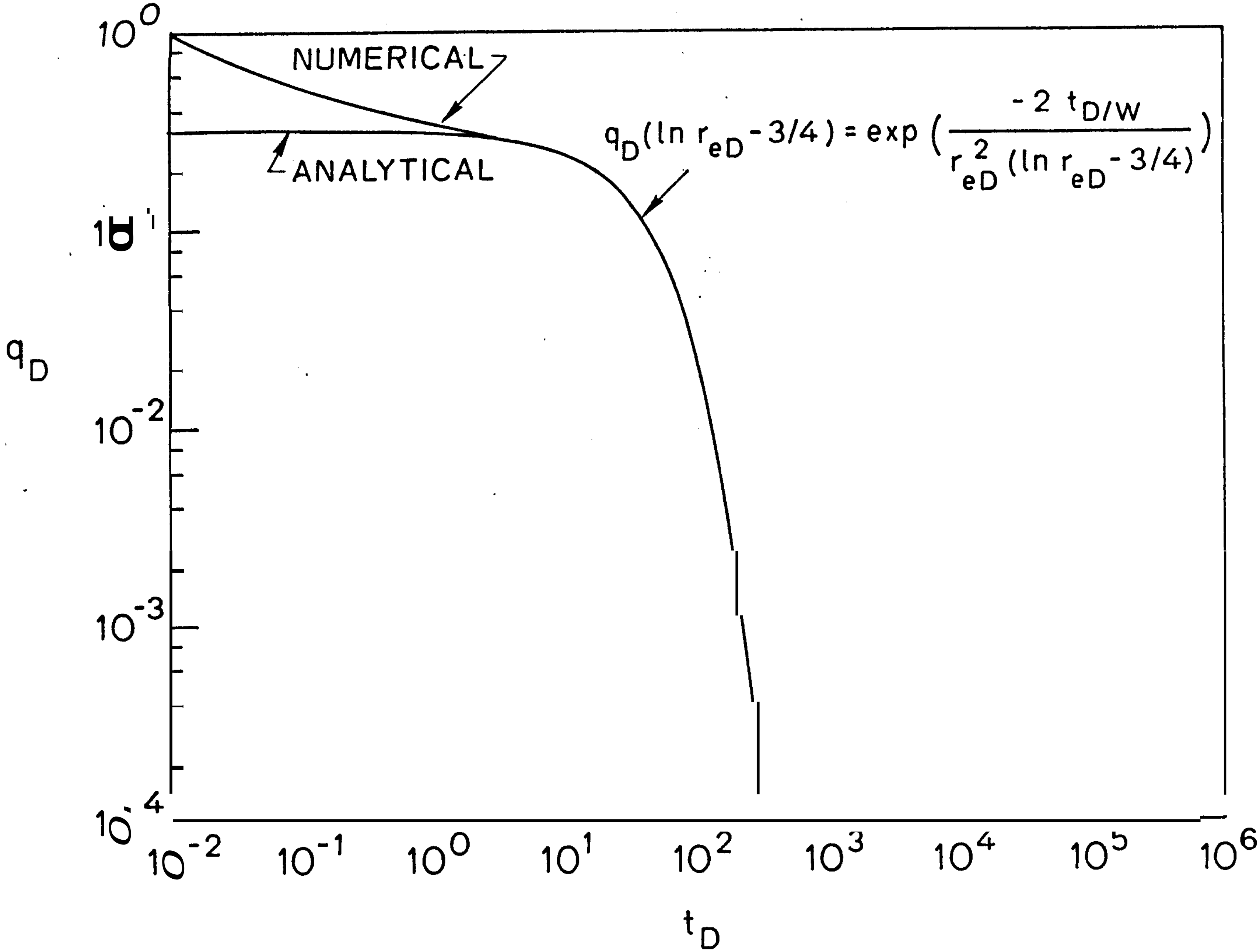

Fig. 2-10: DIMENSIONLESS FLOWRATE FOR CONSTANT-PRESSURE PRODUCTION (r_{eD} = 50, ω = 0.001, $\lambda = 10^{-6}$)—COMPARISON BETWEEN NUMERICAL AND ANALYTICAL SOLUTIONS

noncommunicating matrix, the initial decline is exponential in nature, and can be described by Eq. 2-50.

For a communicating matrix $(\lambda \neq 0)$, the initial decline is not the final state of depletion. This could be considered as an indication of a nonhomogeneous system. However, the solution for a noncommunicating system and the long-time solution as given by Eq. 2-37 can be used to describe the behavior in the general case for a communicating matrix. Figure 2-11 shows the numerical solution for the case where $\omega = 0.01$, and $\lambda = 10^{-6}$. The analytical solution for $\lambda = 0$ and the long-time solution provides a lower boundary to the numerical, or real solution.

From a practical and economic point of view, given an initial value for the flowrate, it is important to know how long it takes to completely deplete the two-porosity system. As seen in Fig. 2-11, the flowrate starts declining until it reaches the approximate value of:

$$q_D \sim \frac{r_{eD}^2 - 1}{2} \lambda \tag{2-51}$$

This will occur at a time given by:

$$t_D = \frac{\ln \dfrac{r_{eD}^2 - 1}{2} \quad (\ln r_{eD} - 3/4)}{\dfrac{\lambda}{1-\omega} - \dfrac{2}{r_{eD}^2 (\ln r_{eD} - 3/4)\,\omega}} \tag{2-52}$$

After this time, the flowrate remains constant until the long-time solution starts dominating.

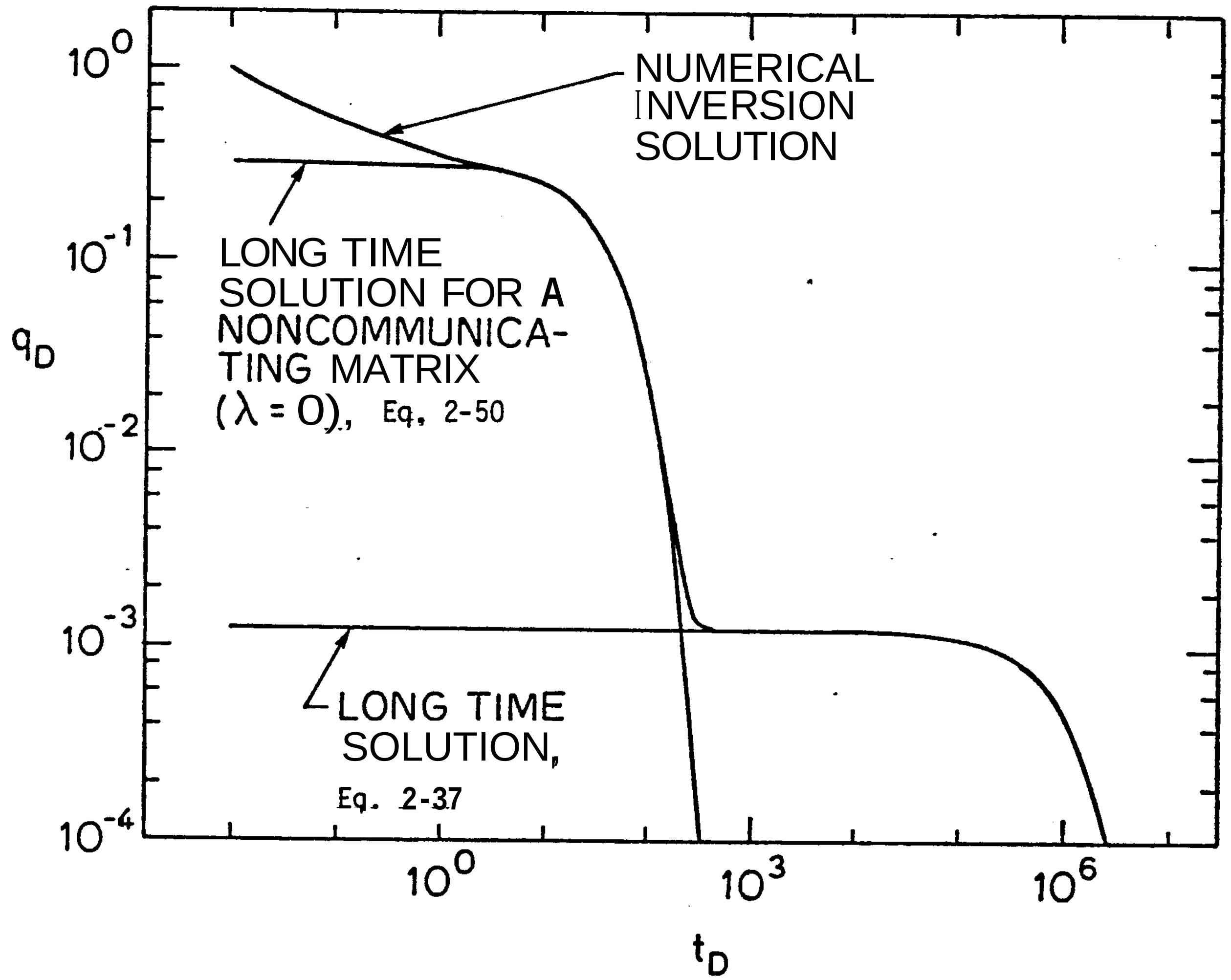

Fig. 2-11: NUMERICAL INVERSION SOLUTION AND LONG-TIME APPROXIMATIONS (r_{eD} = 50, ω = 0.01, and $\lambda = 10^{-6}$)

2.3.5 **DECLINE CURVE ANALYSIS USING TYPE-CURVES**

Fetkovich (1980) described a procedure for using log-log type-curve matching to analyze rate-time data for a homogeneous system. The same method can be applied to naturally-fractured systems. However, the relationship between q_D and t_D is controlled by ω and λ, as well as by other parameters. Thus more than one type-curve may be necessary, especially if ω and λ can not be obtained from pressure buildup data. The type curve corresponding to $\omega = 0.01$ and $\lambda = 5.10^{-6}$ is shown in Figs. 2-12 and 2-13. The solution for a homogeneous system may be obtained by setting $\omega = 1$, and is shown in Figs. 2-12 and 2-13 for comparison with the fractured system results (see dashed lines). The homogeneous system case is the same solution as that presented by Fetkovich (1980) in his Figs. 2A and 2B. The type curve corresponding to $\omega = 0.001$ and $\lambda = 10^{-9}$ is shown in Figs. 2-14 and 2-15 for a range of r_{eD} from 10 to 10,000. In this case, the constant flowrate period is shown for large values of the dimensionless wellbore radius, r_{eD}. Other type curves appear in Appendix C.

It should be possible to obtain ω and λ from pressure buildup data, and either generate or select the proper type curve. That is, once ω and λ are known, a type curve can be created similar to Fig. 2-12 or Fig. 2-14 which can be used to compute production rates for a particular reservoir. A type-curve match should provide information about the fracture permeability and total storativity. Basically, the production rate may be graphed as a function of time on tracing paper, and then placed over the desired type-curve. From a match point, the fracture permeability and the total s-torativity can be calculated. The fracture permeability, k_f, may be obtained from the flowrate, q_D, match:

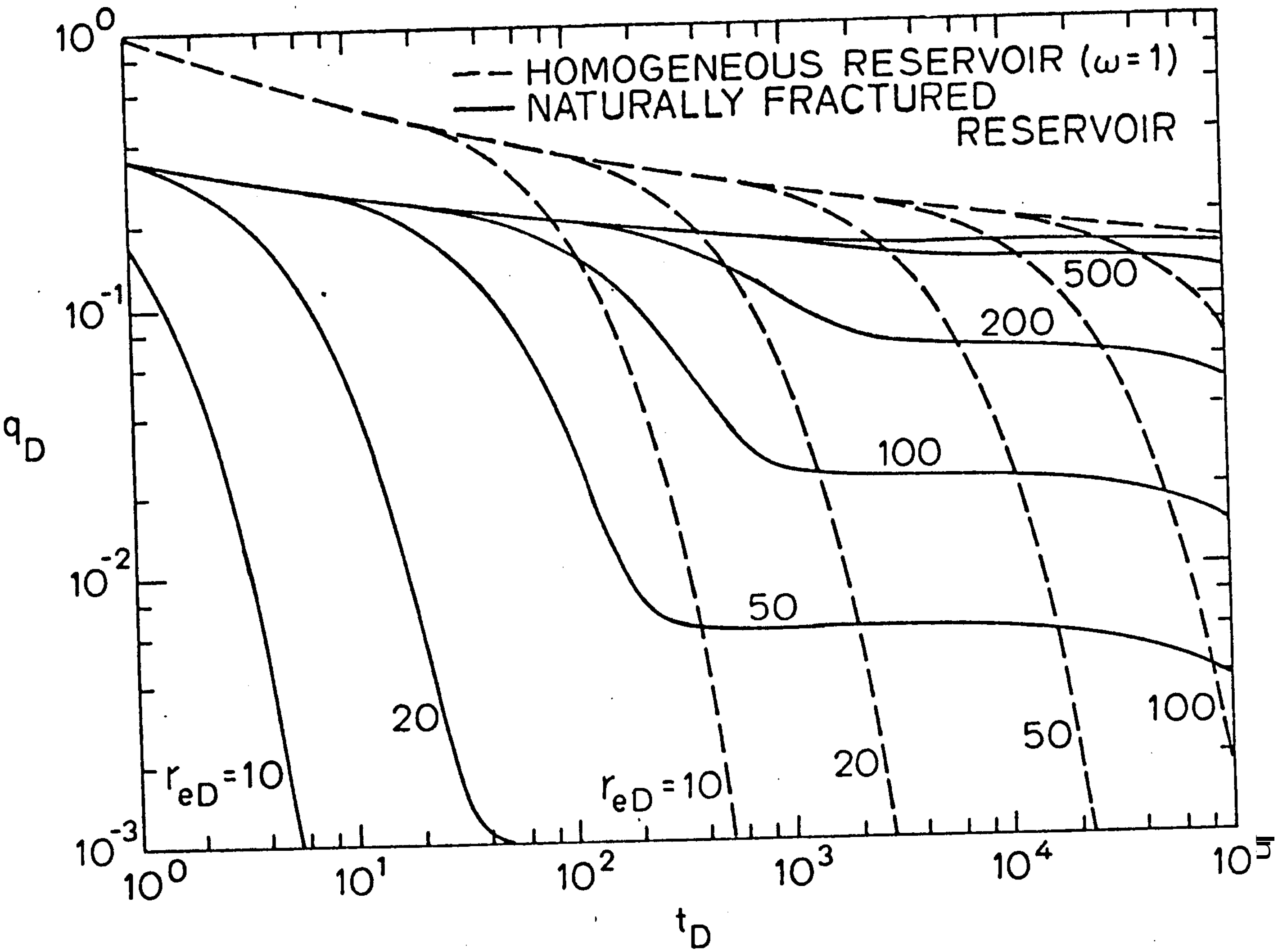

Fig 2-12: q_D VS t_D FOR CONSTANT PRESSURE PRODUCTION
(ω = 0.01, λ = 5×10^{-6}, and skin effect = 0)

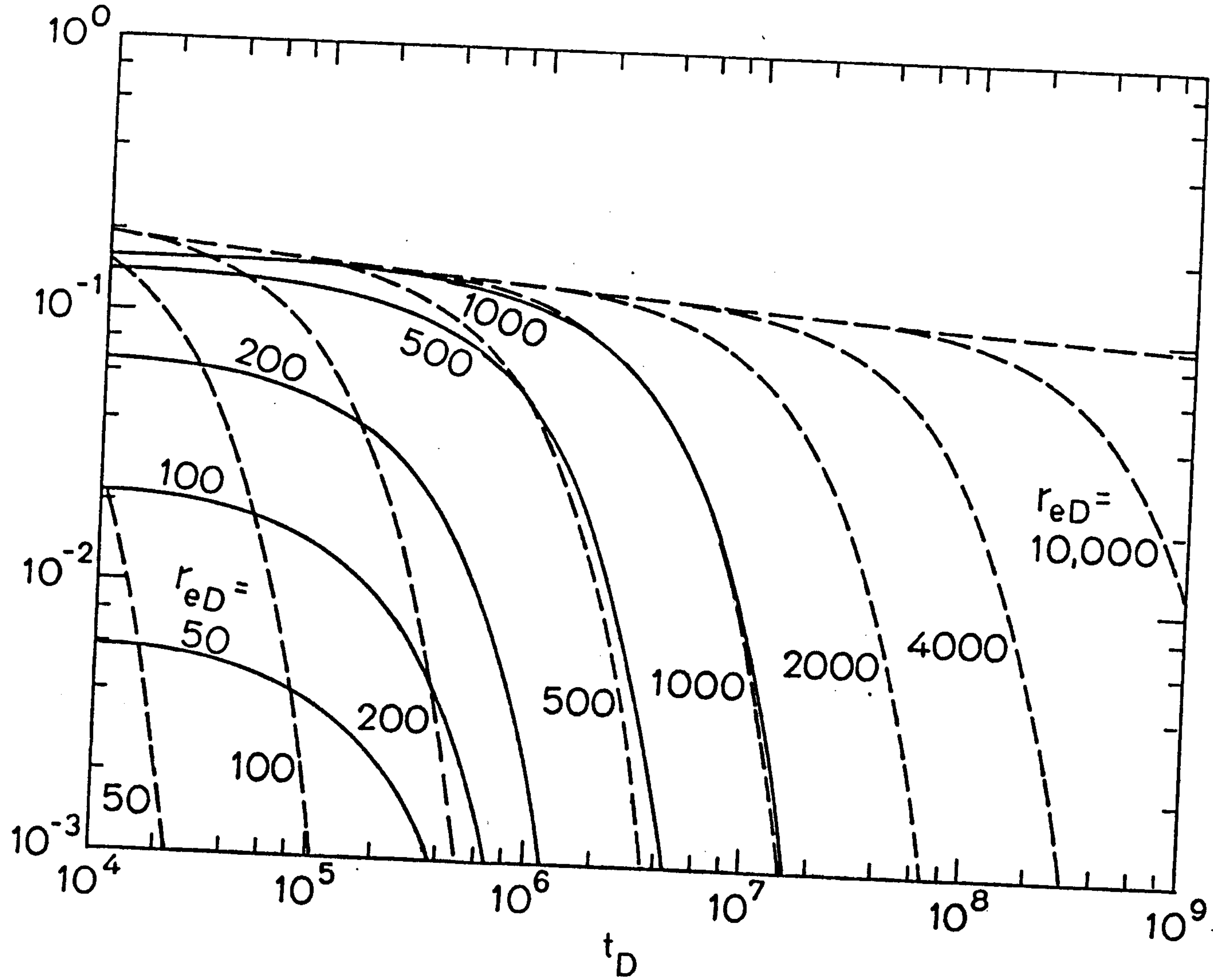

Fig. 2-13: q_D VS t_D FOR CONSTANT PRESSURE PRODUCTION

($\omega = 0.01$, $\lambda = 5x10^{-6}$, and skin effect = 0)

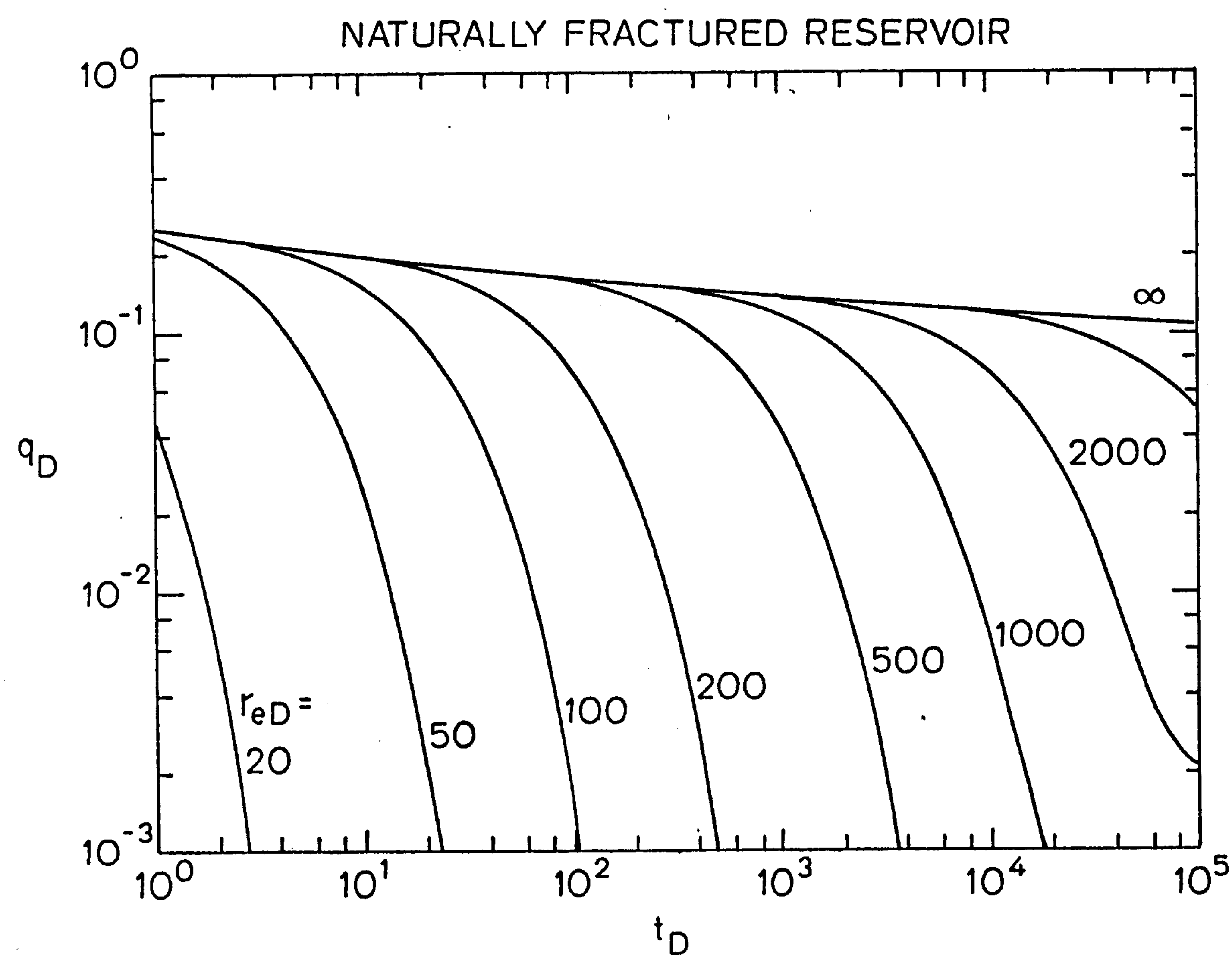

Fig 2-1c: q_D VS t_D FOR CONSTANT PRESSURE PRODUCTION

($\omega = 0.001$, $\lambda = 10^{-9}$, and skin effect = 0)

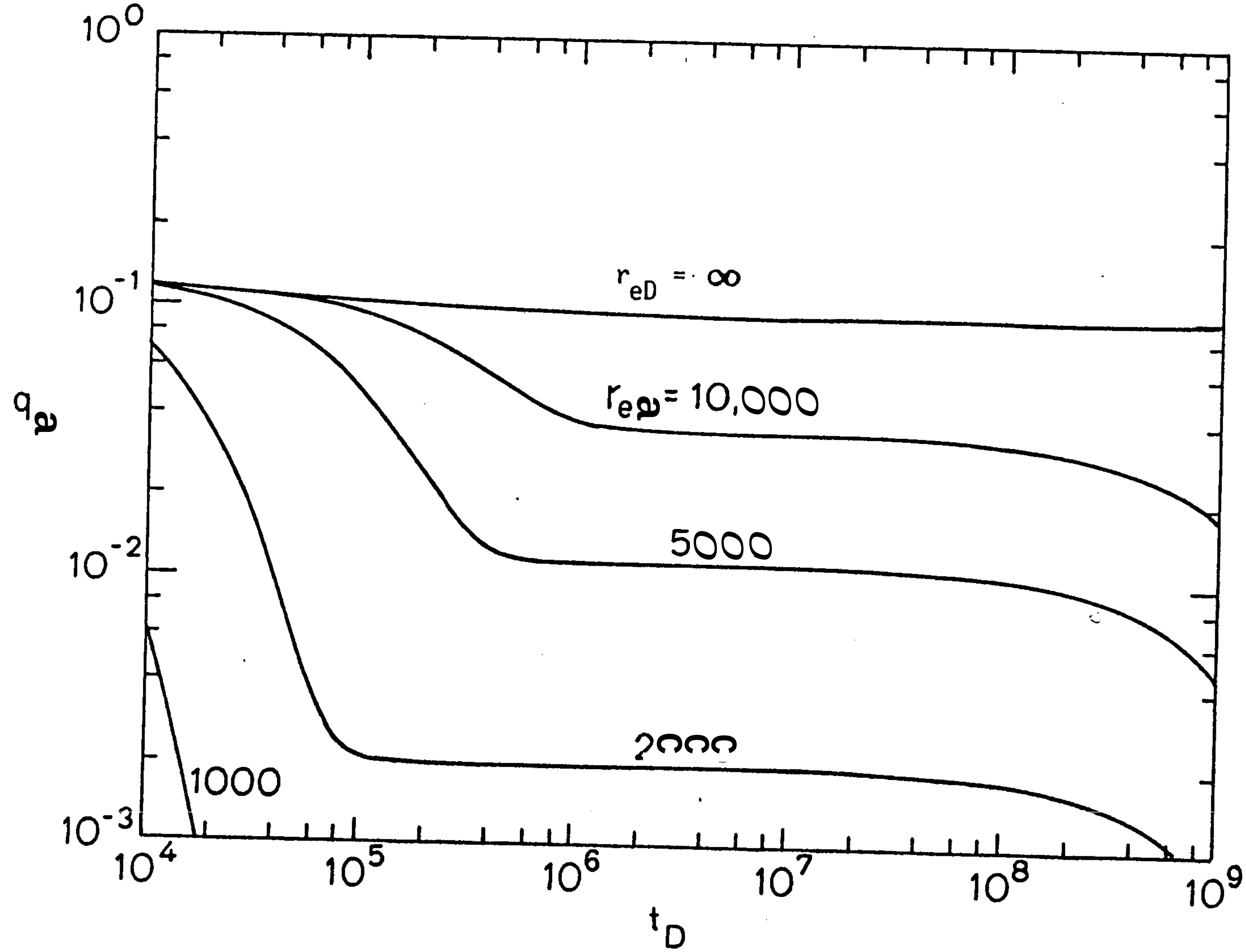

Fig. 2-15: q_D VS t_D FOR CONSTANT PRESSURE PRODUCTION (ω = 0.001, λ = 10^{-9}, and skin effect = 0)

$$k_f = \frac{141.2\ \mu B}{h(p_i - p_{wf})} \left(\frac{q}{q_D} \right)_M \tag{2-53}$$

Similarly, from the time-t_D match point, the total storativity may be obtained:

$$[(\phi c)_m + (\phi c)_f] = \frac{2.637(10^{-4})k_f}{\mu r_w^2} \left(\frac{t}{t_D} \right)_M \tag{2-54}$$

In addition, because λ and ω were determined by selection of the type-curve, some information about the reservoir geometry can be obtained as indicated by the shape factor, a . In fact, the product (αk_m) can be obtained using Eq. 2-55:

$$\alpha k_m = \frac{\lambda k_f}{r_w^2} \tag{2-55}$$

If k_m can be obtained from core analysis, α can be computed. The value of a may yield information about the apparent matrix block dimensions. In a similar manner, using the definition of ω and the total storativity, the fracture storativity can be obtained:

$$(\phi c)_f = [(\phi c)_f + (\phi c)_m] \tag{2-56}$$

From a practical viewpoint, the procedure presented for log-log type-curve matching should be simple if ω and λ can be obtained independently from pressure buildup analysis. Otherwise, more than one type-curve will be necessary to obtain the best match. In this case, for a given r_{eD}', it would be necessary to consider several (3 or 4) values of ω (say, 0.001, 0.01, 0.1 and 1), and 4 or 5 values of (say, 10^{-9}, 10^{-7}, 10^{-6}, 10^{-5}, and 10^{-4} [see Appendix C for a complete set of type curves]) for each ω. As a result, many pairs of ω and might be found for a known r_{eD}. Thus a match point for each could result. However, if ω and λ can be obtained from pressure buildup analysis, then this defines the particular type-curve to be used in production calculations or matching for estimation of reservoir size. In the next section, the practical view of this section is illustrated with an example.

2.3.6 TYPE CURVE MATCHING EXAMPLE

Let us illustrate the use of type-curve matching with a simulated constant pressure drawdown test. The simulated field data used are shown in Table 2-2. The production rate was graphed as a function of time on tracing paper, and then placed over the type curve corresponding to $\omega = 0.01$ and $\lambda = 5.10^{-6}$ (see Fig. 2-16), From the match point, the fracture permeability and the total storativity can be calculated. Using data in Table 2-2, k_f is obtained from the flowrate-q_D match (at q = 100 B/D, $q_D = 0.03$). Using Eq. 2.53 yields:

$$k_f = \frac{(141.2)(1)(1)}{(480)(6500)}\left(\frac{100}{0.03}\right) = 0.15 \text{ md}$$

Similarly, from the time-t_D match point (t = 1 day, t_D = 1500), and using Eq. 2-56, the total storativity $[(\phi c)_m + (\phi c)_f]$ is:

$$[(\phi c)_m + (\phi c)_f] = \frac{2.637(10^{-4})(0.15)}{(1)(0.25)^2}\left(\frac{24}{1500}\right)$$

$$= 10.1 \times 10^{-6} \text{ psi}^{-1}$$

Table 2–2

DATA FOR SIMULATED EXAMPLE PROBLEM

$p_i - p_{wf}$ = 6500 psi	μ = 1 cp	r_e = 1500 ft
S = −4.09	B = 1 RB/STB	r'_{eD} = 100
h = 48Q ft	r_w = 0.25 ft	r'_w = 15 ft

t Days	q B/D
0.02	740
0.03	680
0.04	620
0.06	540
0.08	470
0.12	360
0.17	250
0.21	210
0.27	160
0.34	125
0.40	105
0.50	88
0.70	79
0.90	76
1.20	76
2.00	74

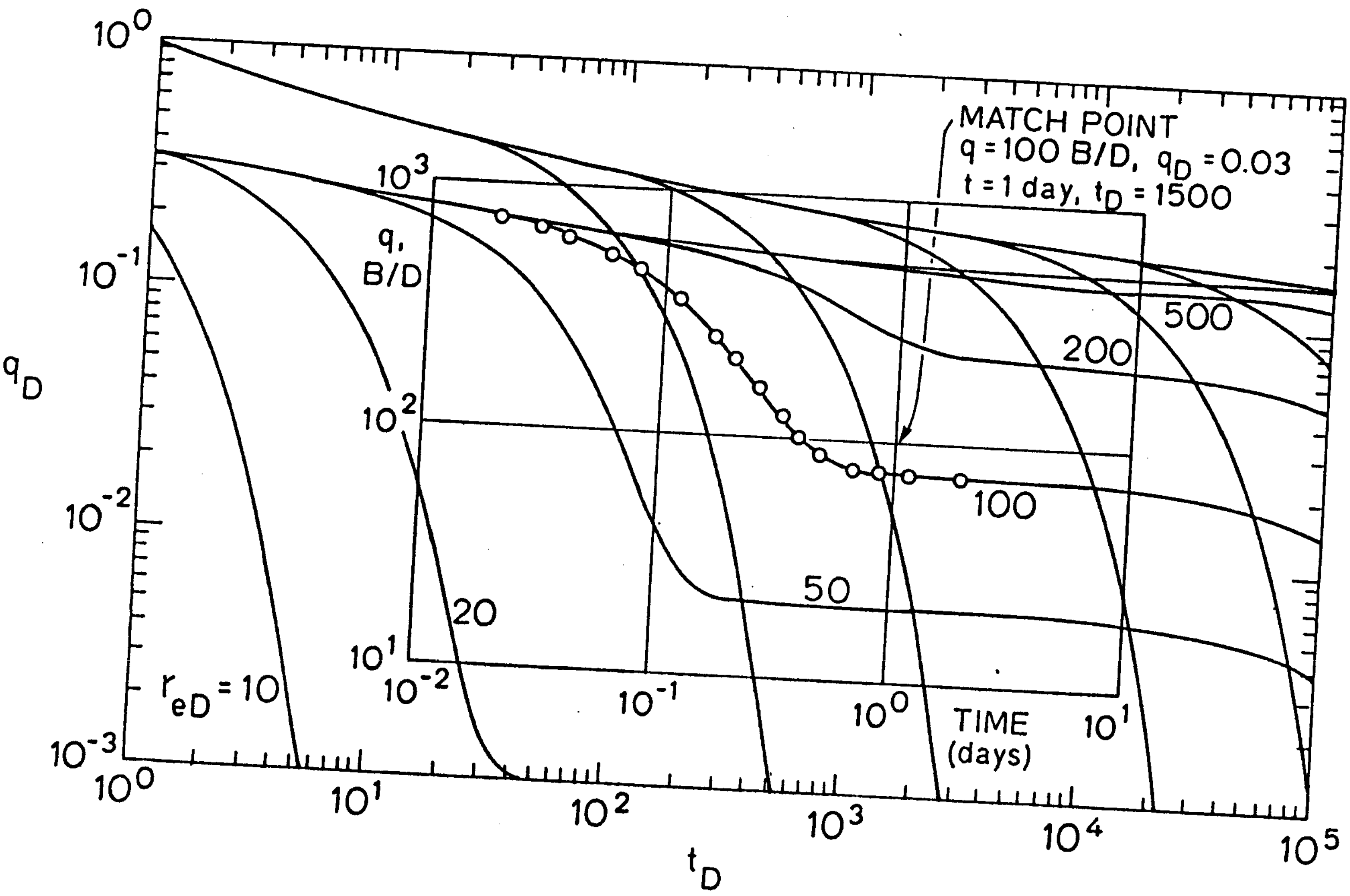

Fig. 2-16: TYPE-CWRWE MATCHING EXAMPLE PROBLEM

The product "αk_m" can be obtained using Eq. 2-55:

$$\alpha k_m = \frac{5.10^{-6}(0.15)}{(0.25)^2} = 1.2 \times 10^{-5} \text{ md-ft}^{-2}$$

Thus, if k_m can be obtained from core analysis, α can be computed:

$$\alpha = \frac{1.2 \times 10^{-5}}{k_m} \text{ ft}^{-2}$$

The fracture storativity can be obtained from Eq. 2.56:

$$(\Phi c)_f = (0.01)\,(10.1 \times 10^{-6})$$

$$= 1.01 \times 10^{-7} \text{ psi}^{-1}$$

2.3.7 **INTERFERENCE ANALYSIS**

The solutions for the dimensionless pressure presented in the previous sections are valid at the producing well. In this section the solutions for the pressure variations away from the well are presented. The study for wells producing at a constant flowrate is presented in later sections of this work. In the case of homogeneous systems, interference tests have been used with success in many cases, see for example, Earlougher (1977). For wells producing at a constant inner pressure, Ehlig-Economides (1979) observed that, unlike the constant rate solution, the pressure distribution for constant inner pressure does not correlate with the line-source solution. Figure 2-17 shows the pressure behavior at various well locations for a well produced at constant pressure in an infinitely large, homogeneous system. This case is obtains by setting $\omega = 1$.

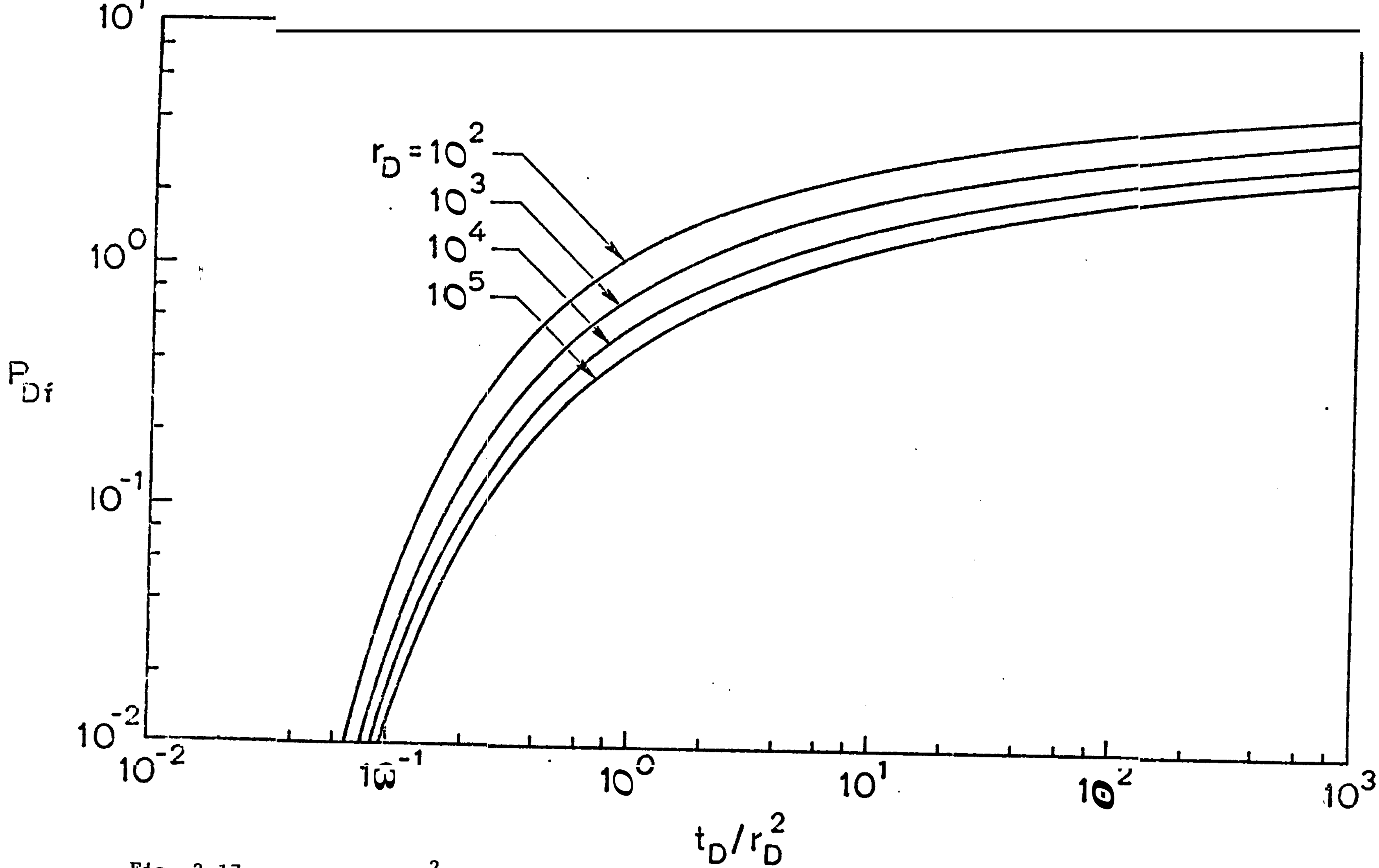

Fig. 2-17: P_{fD} VS t_D/r_D^2 FOR A WELL PRODUCED AT CONSTANT PRESSURE IN AN INFINITELY LARGE HOMOGENEOUS SYSTEM

A different solution results for each value of r_D. Considering the homogeneous reservoir solution, a particular case of the naturally-fractured reservoir solution, it can be expected that the same dependence on r_D applies for two-porosity systems, The r_D dependence will introduce another variable in the analysis. That is, the dimensionless pressure is a function of t_D/r_D^2, ω, λ, and r_D. As observed by Stresltsova-Adams (1976), both the fracture and the matrix pressure should be considered in the analysis of tests made on fractured formations.

Let us start analyzing the dimensionless fracture pressure behavior. Fig. 2-18 shows p_{fD} vs t_D/r_D^2 for the case of $r_D = 1000$, and several values of ω and λ. The case $\omega = 1$ is shown for comparison with a homogeneous system. At early times, the solutions depend on t_D/r_D^2 and ω for a given r_D. At long times, the solution becomes the homogeneous case. The time at which the transition occurs depends on the λ value: the larger the value of λ the sooner the jump. The Laplace space solution for the dimensionless fracture pressure is given in Appendix B.

$$\overline{p_{fD}} = \frac{K_0(\sqrt{sf(s)}\, r_D)}{s\, K_0(\sqrt{sf(s)}\,)} \qquad (2\text{-}57)$$

A short-time approximation to Eq. 2-57 yields the relation:

$$\lim_{s\to\infty} \overline{p_{fD}} = \frac{K_0(\sqrt{\omega s}\, r_D)}{s\, K_0(\sqrt{\omega s})} \qquad (2\text{-}58)$$

As shown in Appendix B, the inversion of Eq. 2-58 yields the following equation for p_{fD} :

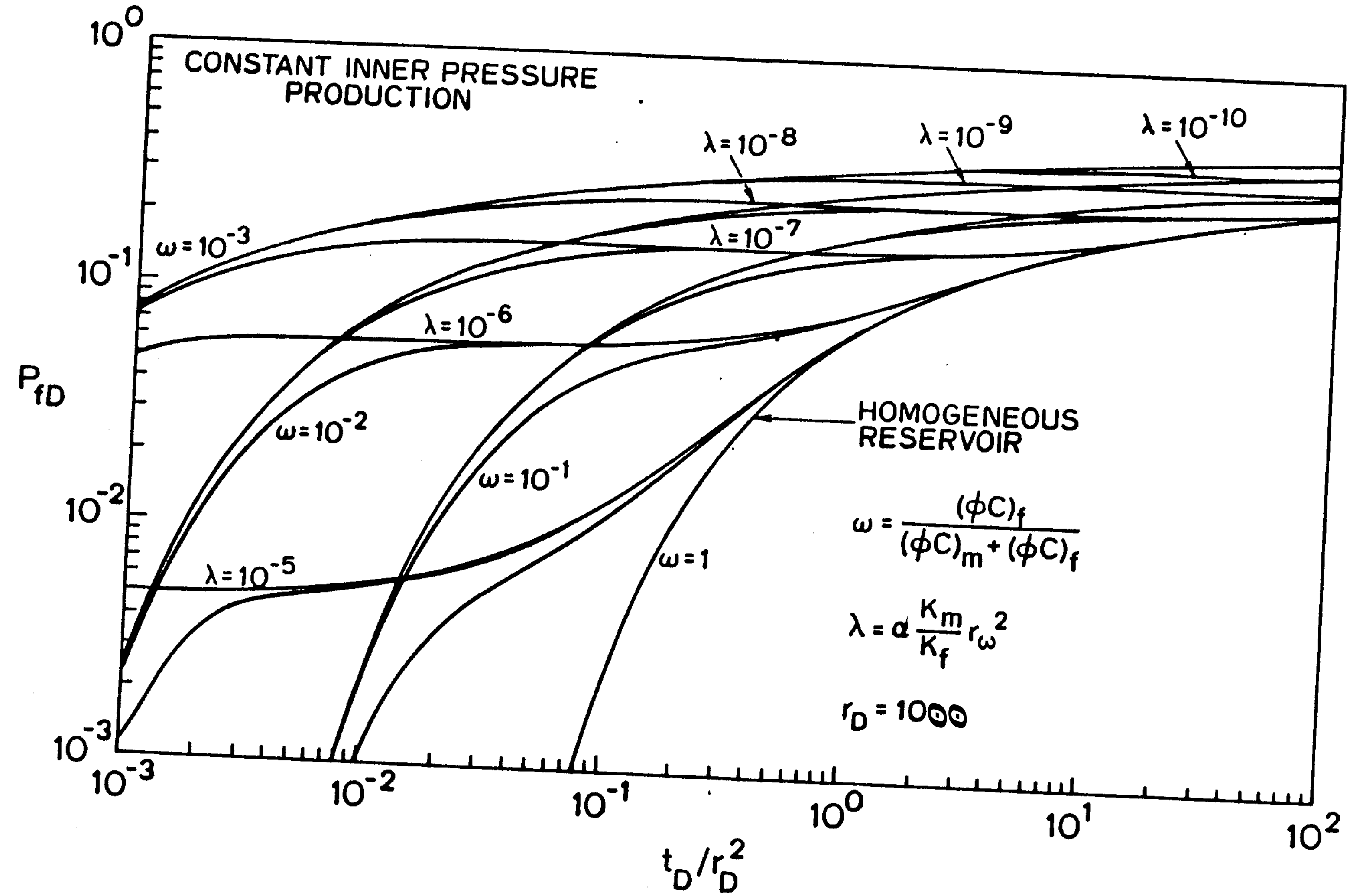

Fig. 2-18: P_{fD} VS t_D/r_D^2 FOR A WELL PRODUCED AT CONSTANT INNER PRESSURE FROM AN INFINITELY LARGE, NATURALLY-FRACTURED RESERVOIR (r_D = 1000)

$$p_{fD} = \frac{\sqrt{r_D}}{r_D} \operatorname{erfc}\left(\frac{r_D - 1}{2\sqrt{t_D/\omega}}\right) \tag{2-59}$$

The behavior represented by Eq. 2-59 is that for a homogeneous reservoir with an effective time $t_D' = t_D/\omega$.

A long-time approximation to Eq. 2-57 is obtained in the limit where $s \to 0$. In this case Eq. 2-57 reduces to:

$$\lim_{s\to 0} \bar{p}_{fD} = \frac{K_0\,(\sqrt{s}\; r_D)}{s\; K_0\,(\sqrt{s}\;)} \tag{2-60}$$

which is the Laplace space solution for a homogeneous system at long times. Let us now consider the analysis of the matrix pressure behavior. Fig. 2-19 shows the solution for the dimensionless matrix pressure, p_{mD} vs t_D/r_D^2 , for a well produced at a constant inner pressure. The figure shows several curves corresponding to different values of ω and λ for $r_D = 1000$. The curve for $\omega = 1$ corresponds to the homogeneous case and agrees with the solution presented by Ehlig-Economides (1979) for a homogeneous system. As derived in Appendix B, the Laplace space solution for the dimensionless matrix pressure behavior is given by:

$$\bar{p}_{mD} = \frac{\lambda}{(1-\omega)s + \lambda}\;\frac{K_0\,(\sqrt{sf(s)}\; r_D)}{s\; K_0\,(\sqrt{sf(s)}\;)} \tag{2-61}$$

A short time approximation is obtained in the limit when $s \to \infty$. As shown in Appendix B, Eq. 2-61 reduces to:

$$\lim_{s\to\infty} \bar{p}_{mD} = \frac{\lambda\sqrt{r_D}}{r_D}\;\frac{1}{s^2}\; e^{-\sqrt{\omega}(r_D-1)\sqrt{s}} \tag{2-62}$$

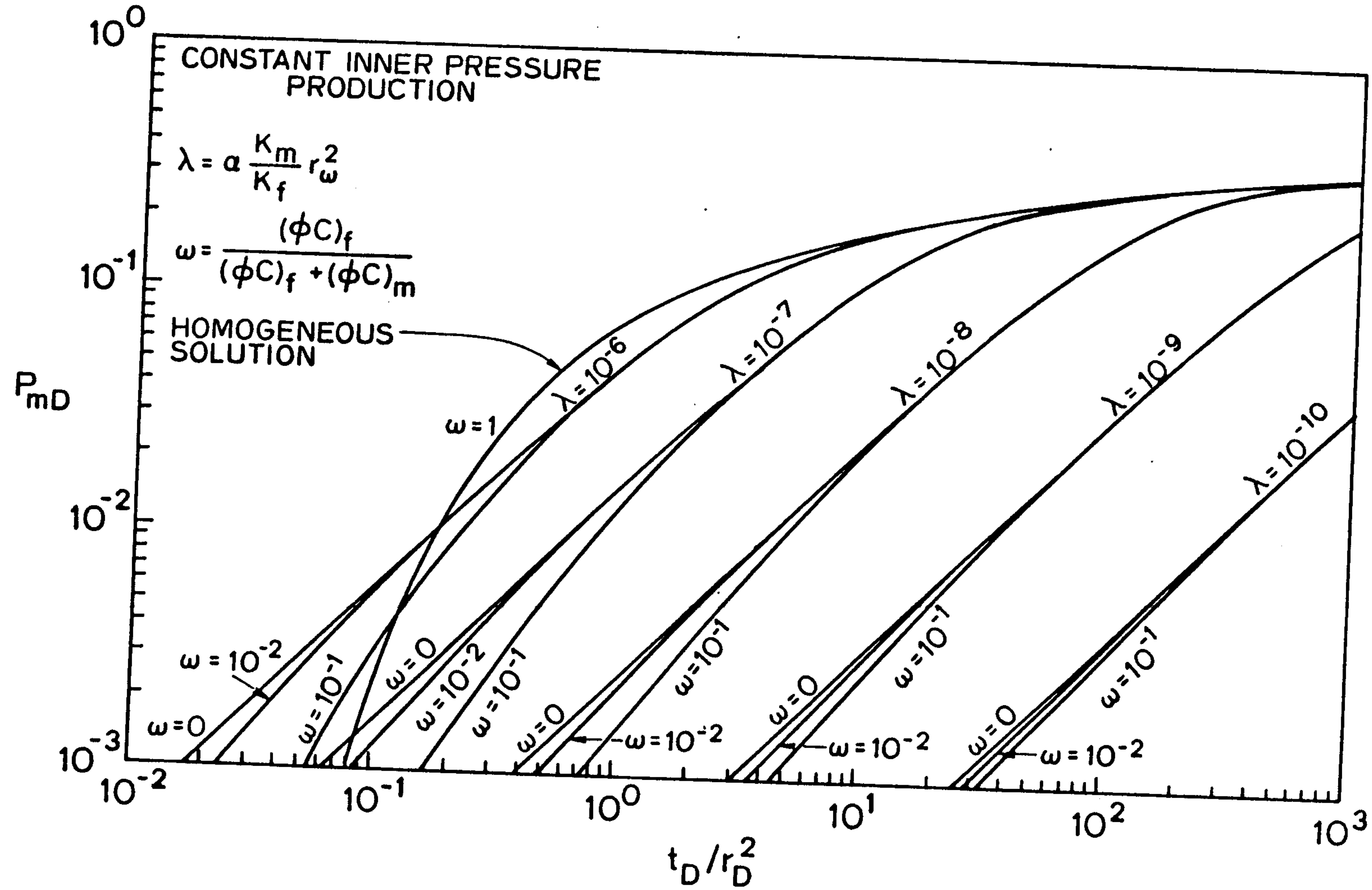

Fig. 2-19: P_{mD} VS t_D/r_D^2 FOR A WELL PRODUCED AT CONSTANT PRESSURE FROM AN INFINITELY LARGE, NATURALLY-FRACTURED RESERVOIR (r_D = 1000)

Inverting Eq. 2-62 yields the following expression for p_{mD} valid at short times:

$$\lim_{t_D \to 0} p_{mD} = \frac{4\lambda\omega\sqrt{r_D}}{rD}\left(\frac{t_D}{\omega}\right)\left[i^2 \ \text{erfc}\left(\frac{r_D - 1}{2\sqrt{t_D/\omega}}\right)\right] \qquad (2\text{-}63)$$

Equation 2-63 reduces to a simple expression for the case $\omega = 0$, since:

$$i^n \ \text{erfc}\ 0 = \frac{1}{2^n \Gamma\ \frac{n}{2} + 1}$$

for $n = 2$

$$i^2 \ \text{erfc}\ 0 = \frac{1}{4}$$

then:

$$\lim_{t_D \to 0} p_{mD} = \frac{\lambda\sqrt{r_D}}{rD} t_D \qquad (2\text{-}64)$$

As shown in Fig. 2-19, the case $\omega = 0$ is characterized by straight lines of unit slope at short times. In this case, Eq. 2-64 can be used to understand the observed behavior.

The linear relation between p_{mD} and t_D deserve spe ial attenti n For homogeneous systems, a similar relation between p_D and t_D exists when wellbore storage effects are present:

$$p_D = t_D / C_D \qquad (2\text{-}65)$$

Although the solution given by Eq. 2-64 is for a well producing at; a constant inner pressure, it should be stressed that the observed linear relation is not a wellbore storage effect; rather, it should be considered as an inherent property of a naturally fractured system. For a well producing at a constant flowrate, as seen in the next section, the same linear relation exists for the dimensionless matrix pressure as shown in Fig. 2-19.

3.0 TRANSIENT PRESSURE ANALYSIS- CONSTANT FLOWRATE PRODUCTION

Although some of the basic solutions for transient pressure testing for wells produced at a constant flowrate from a naturally-fractured reservoir have been published, interpretations based on such solutions have been the subject of controversy. In this section, the solutions for the dimensionless wellbore pressure for a well producing at a constant flowrate are presented.

In Section 3.1 the basic partial differential equations which define the problem are given. In Section 3.2, the analytical solutions in Laplace space for both the infinitely large and the closed outer boundary are presented. Also included in this part is the analytical solution presented by Warren and Root (1963) for a closed outer boundary, which was found to be useful in the interpretation of the observed results. A short-time and long-time approximation is also presented. In Section 3.3, the method commonly used to analyze pressure buildup tests are presented. The Horner (1951) and the Pollard (1959) graphs are studied. Also included in this section is a new method to determine the permeability-thickness product for a naturally-fractured reservoir. The method involves a semilog graph of the dimensionless pressure difference log $(\bar{p}-p_{ws})_D$ dimensionless shut-in time, Δt_{AD} . The dimensionless matrix and fracture pressures in the formation are presented.

3.1 PARTIAL DIFFERENTIAL EQUATIONS

In this section the solution is given for the dimensionless wellbore pressure for a well producing at a constant rate. Depending on the outer boundary conditions, two cases are discussed: the infinite outer boundary case and the closed outer boundary case. The basic partial differential equations are:

$$\frac{\partial^2 p_{fD}}{\partial r_D^2} + \frac{1}{r_D}\frac{\partial p_{fD}}{\partial r_D} = (1-\omega)\frac{\partial p_{mD}}{\partial t_D} + \omega\frac{\partial p_{fD}}{\partial t_D} \qquad (3\text{-}1)$$

$$(1-\omega)\frac{\partial p_{mD}}{\partial t_D} = \lambda\,(p_{fD}-p_{mD}) \qquad (3\text{-}2)$$

where ω and λ are defined in Section 2. For a two-porosity system at constant pressure initially, the initial condition is given by:

$$p_{fD}(r_D,0) = p_{mD}(r_D,0) = 0 \qquad (3\text{-}3)$$

Unlike the case for a well producing at constant inner pressure, the well-bore storage condition must be considered for the constant producing rate case:

$$C_D\frac{\partial p_{fwD}}{\partial t_D} - \left(\frac{\partial p_{fD}}{\partial r_D}\right)_{r_D} = 1 \qquad (3\text{-}4)$$

where:

$$C_D = \frac{C}{2\pi h(\phi_f c_f + \phi_m c_m) r_w^2}$$

The skin effect condition is:

$$p_{fwD} = p_{fD} - S\left(\frac{\partial p_{fD}}{\partial r_D}\right) \qquad (3\text{-}5)$$

Two outer boundary conditions are considered: an infinitely large reservoir and a closed outer boundary. For an infinitely large reservoir, we have:

$$\lim_{r_D \to \infty} p_{fD}(r_D, t_D) = 0 \qquad (3\text{-}6)$$

For the closed outer boundary, the condition is:

$$\left.\frac{\partial p_D}{\partial r_D}\right|_{r_D = r_{eD}} = 0 \qquad (3\text{-}7)$$

The wellbore storage boundary condition adds one more parameter on which the wellbore pressure will depend. Thus, for a well producing at constant surface flowrate, the wellbore pressure is controlled by four parameters: ω , λ , S , and C_D .

3.2 DIMENSIONLESS WELLBORE PRESSURE SOLUTIONS

The solutions for the dimensionless wellbore pressure from either an infinite or a closed outer boundary system have appeared in several places in the literature (see, e.g., Warren and Root, (1963); Mavor and Cinco–Ley, (1979)). However, for proper understanding of the following sections, a brief study of each case will be made here. The solutions in Laplace space for a well producing at a constant rate from a two–porosity system are shown in Table 3–1.

3.2.1 INFINITE OUTER BOUNDARY

The Laplace space solution for a dimensionless wellbore pressure for a well producing at a constant flowrate from an infinite two–porosity

Table 3.1: LAPLACE SPACE SOLUTIONS FOR THE DIMENSIONLESS WELLBORE PRESSURE IN A WELL PRODUCING AT A CONSTANT RATE FROM A TWO-POROSITY SYSTEM

INFINITE OUTER BOUNDARY

$$\bar{p}_{fwD} = \frac{K_0\left(\sqrt{sf(s)}\right) + S\sqrt{sf(s)}\,K_1\left(\sqrt{sf(s)}\right)}{s\left[\sqrt{sf(s)}\,K_1\left(\sqrt{sf(s)}\right) + s\,C_D\left(K_0\left(\sqrt{sf(s)}\right) + S\sqrt{sf(s)}\,K_1\left(\sqrt{sf(s)}\right)\right)\right]}$$

CLOSED OUTER BOUNDARY

$$\bar{p}_{fwD} = \frac{K_1\left(\sqrt{sf(s)}\,r_{eD}\right) I_0\left(\sqrt{sf(s)}\,r_D\right) + K_0\left(\sqrt{sf(s)}\,r_D\right) I_1\left(\sqrt{sf(s)}\,r_{eD}\right)}{s^2\left[K_1\left(\sqrt{sf(s)}\,r_{eD}\right) I_0\left(\sqrt{sf(s)}\right) - K_0\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\,r_{eD}\right)\right] C_D - (1 + s\,S\,C_D)\sqrt{sf(s)}\left[K_1\left(\sqrt{sf(s)}\,r_{eD}\right) I_1\left(\sqrt{sf(s)}\right) - K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\,r_{eD}\right)\right]}$$

where

$$f(s) = \frac{\omega(1-\omega)s + \lambda}{(1-\omega)s + \lambda}$$

s = Laplace space variable

S = skin effect

system is given by:

$$\bar{p}_{fwD} = \frac{K_0\left(\sqrt{sf(s)}\right) + S\sqrt{sf(s)}\,K_1\left(\sqrt{sf(s)}\right)}{s\left[\sqrt{sf(s)}\,K_1\left(\sqrt{sf(s)}\right) + s\,C_D\left(K_o\,\sqrt{sf(s)}\right) + S\sqrt{sf(s)}\,K_1\left(\sqrt{sf(s)}\right)\right]} \tag{3-8}$$

Figure 3–1 shows the solution for p_{fwD} obtained by inverting Eq. 3–8 numerically for two values of ω and several values of λ ($C_D = 0$ and skin effect = 0). At early times, p_{fwD} depends on t_D and ω. For a given value of λ, as time increases a period is reached wherein the pressure tries to stabilize due to flow from the matrix. After this transition period, the solution becomes the same as that for a homogeneous system. It is the same behavior observed for the flowrate in an infinite system (see Section 2). .

An analysis similar to that made for the dimensionless flowrate in an infinite system will be presented for proper understanding of the observed behavior.

A short–time approximation to Eq. 3–8 can be obtained by replacing K_0 and K_1 by their respective asymptotic expansions. This yields an expression in Laplace space which is simple to invert. The following equation is obtained for the dimensionless wellbore pressure (see Appendix A):

$$p_{f\omega D} = \frac{2}{\sqrt{\pi}}\left(\frac{t_D}{\omega}\right)^{1/2} \tag{3-9}$$

For $\omega = 1$, Eq. 3–9 is identical to Eq. VI–1 presented by van Everdingen and Hurst (1949) for a homogeneous system. There is no λ dependence at small times, indicating that the fracture system does not

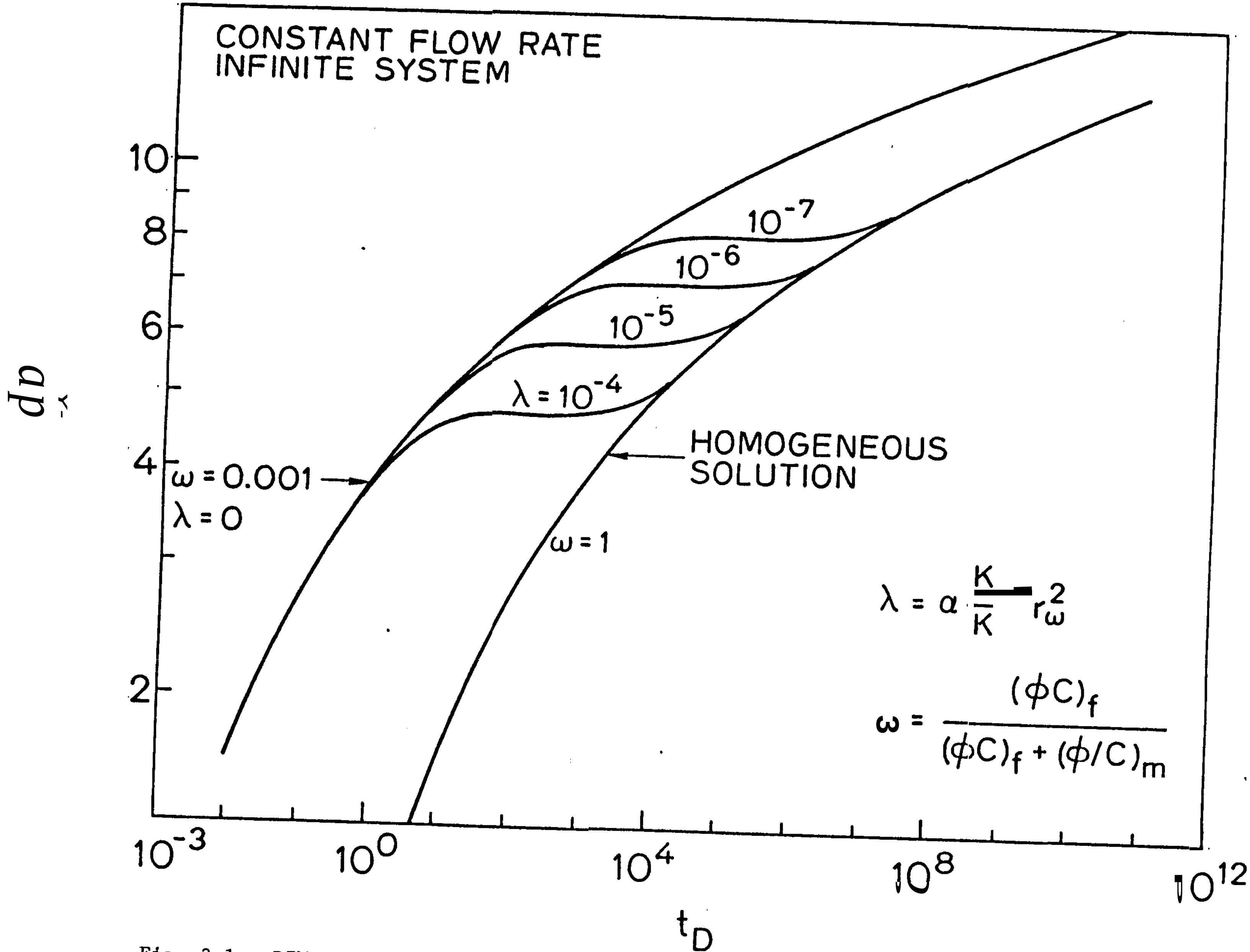

Fig. 3-1: DIMENSIONLESS WELLBORE PRESSURE VS DIMENSIOI
CONSTANT FLOWRATE FROM AN INFINITELY LARGE :

sense the presence of the primary porosity at small times. For a non-communicating matrix ($\lambda = 0$), the dependence of p_{fwD} will be on t_D/ω for all times (assuming $C_D = 0$ and skin effect = 0).

A long-time approximation to Eq. 3-8 can be obtained by replacing K_0 and K_1 by series expansions. Inverting the resulting expression yields the following relation valid for long times (see Appendix A):

$$p_{fwD} = \frac{1}{2} [\ell n \; t_D + 0.80981 \tag{3-10}$$

Equation 3-10 is the line source solution for a homogeneous system.

3.2.2 <u>CLOSED OUTER BOUNDARY</u>

The Laplace space solution for the dimensionless wellbore pressure in a well produced at a constant flowrate from a two-porosity system is given by:

$$\bar{p}_{fwD} = \frac{K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_0\left(\sqrt{sf(s)}\, r_D\right) + K_0\left(\sqrt{sf(s)}\, r_D\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)}{s^2\left[K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_0\left(\sqrt{sf(s)}\right) - K_0\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)\right] C_D - s\left[1 + s\,S\,C_D\right]\sqrt{sf(s)}\left[K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right) - K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right)\right]} \tag{3-11}$$

Equation 3-11 reduces to Eq. VII-11 presented by van Everdingen and Hurst (1949) for the case of skin effect = 0, $C_D = 0$, and $\omega = 1$. Figure **3-2** shows the solution for the dimensionless wellbore pressure obtained by numerical inversion of Eq. 3-11. The solutions for limiting values in ω and several values of λ are shown. At early times, the solution depends on t_D and ω (assuming skin effect = 0 and $C_D = 0$) for any value of λ. The system behaves as infinitely acting.

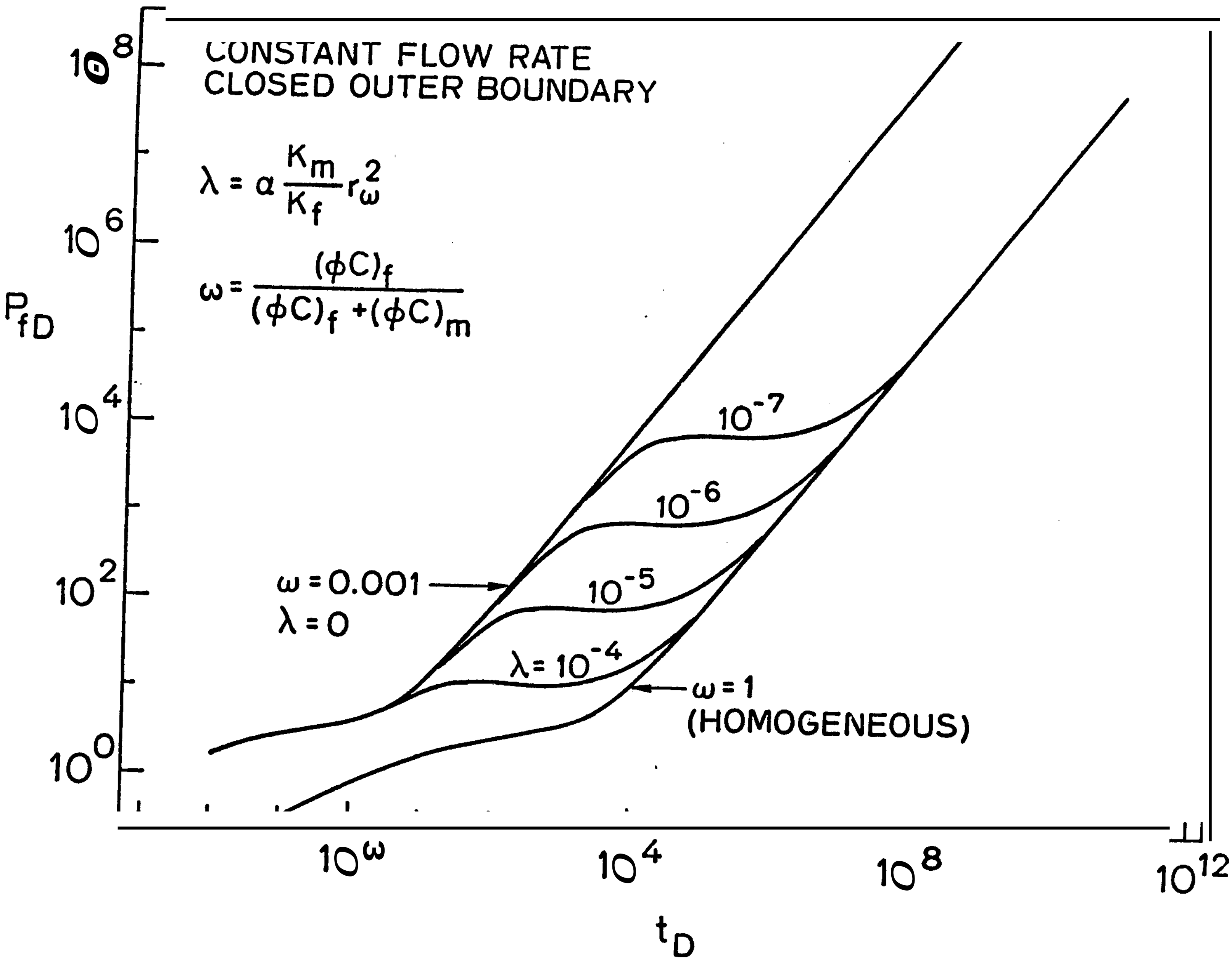

Fig. 3.2: DIMENSIONLESS WELLBORE PRESSURE VS DIMENSIONLESS TIME FOR A WELL PRODUCED AT CONSTANT FLOWRATE FROM A BOUNDED, TWO-POROSITY SYSTEM (r_{eD} = 50, skin effect = 0)

For a given value of λ and $\omega \neq 1$, after the infinite-acting period, the solution goes through a transition period to finally meet the solution for a homogeneous system. Depending on the value of λ (different than zero), two well-defined straight lines (pseudosteady-state solutions) are observed.

To understand the observed behavior, the analytical solution (valid for $C_D = 0$ and skin effect = 0) presented by Warren and Root (1963) will be analyzed:

$$p_{fwD} = \frac{2}{r_{eD}^2 - 1} \left\{ \frac{1}{4} + t_D + \frac{(1-\omega)^2}{\lambda} \left[1 - e^{-\frac{\lambda t_D}{\omega(1-\omega)}} \right] \right\} - \frac{3r_{eD}^4 - 4r_{eD}^4 \ln r_{eD} - 2r_{eD}^2 - 1}{4(r_{eD}^2 - 1)^2} \quad (3\text{-}12)$$

The solution can be simplified by considering that in most cases $r_{eD}^2 >> 1$, Then the term $r_{eD}^2 - 1$ can be replaced by r_{eD}^2 in Eq. 3-12. The following expression is obtained for the dimensionless wellbore pressure in a closed system:

$$p_{fwD} = \frac{2t_D}{r_{eD}^2} + (\ln r_{eD} - 3/4) + \frac{2(1-\omega)^2}{\lambda r_{eD}^2} \left(1 - e^{-\frac{\lambda t_D}{\omega(1-\omega)}} \right) \quad (3\text{-}13)$$

For a well in a center of a closed circle, the term $\ln(r_{eD} - 3/4)$ is equal to:

$$\ln r_{eD} - 3/4 = \frac{1}{2} \ln \left(\frac{2.2458A}{C_A \, r_w^2} \right) \quad (3\text{-}14)$$

Then Eq. 3-13 reduces to: ·

$$p_{fwD} = 2\pi t_{AD} + \frac{1}{2}\ \ell n\left(\frac{2.2458A}{C_A\ r_w^{\ 2}}\right) + \frac{2\pi(1-\omega)^2}{\lambda A}\left(1 - e^{-\frac{\lambda A t_{AD}}{\omega(1-\omega)}}\right) \tag{3-15}$$

The exponential term in Eq. 3-15 can be expanded using the power series:

$$e^{-x} = 1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \cdot\ \cdot\ \cdot \tag{3-16}$$

Then Eq. 3-15 reduces to:

$$p_{fwD} = \frac{2\pi t_{AD}}{\omega} + \frac{1}{2}\ \ell n\left(\frac{2.2458A}{C_A\ r_w^{\ 2}}\right) + \mathcal{O}\left(\lambda\left(\frac{t_{AD}}{\omega}\right)^2\right) \tag{3-17}$$

As inherent in the asymptotic approximation, Eq. 3-17 is valid for $\frac{t_{AD}}{\omega} \geq 0.1$. For a noncommunicating matrix $(\lambda = 0)$, Eq. 3-17 reduces to:

$$p_{fwD} = \frac{2\pi t_{AD}}{\omega} + \ell n\ \frac{2.2458A}{C_A\ r_w^{\ 2}} \tag{3-18}$$

This is the expression defining the pseudosteady-state condition for a system where $t'_{AD} = t_{AD}/\omega$. Figure 3-3 shows the solution given by Eq. 3-18 for the case where $\omega = 0.01$, and $\lambda = 0$. In this case, the system behaves as a homogeneous one, but shifted in time by t_D/ω . For values of $\lambda \neq 0$, the pressume is not, in general, a linear function of t_{AD} . The departure depends on λ and t_{AD} , as shown in Fig. 3-3. In all cases shown, the solution becomes approximately equal to the homogeneous solution for long values of time. This can be understood using

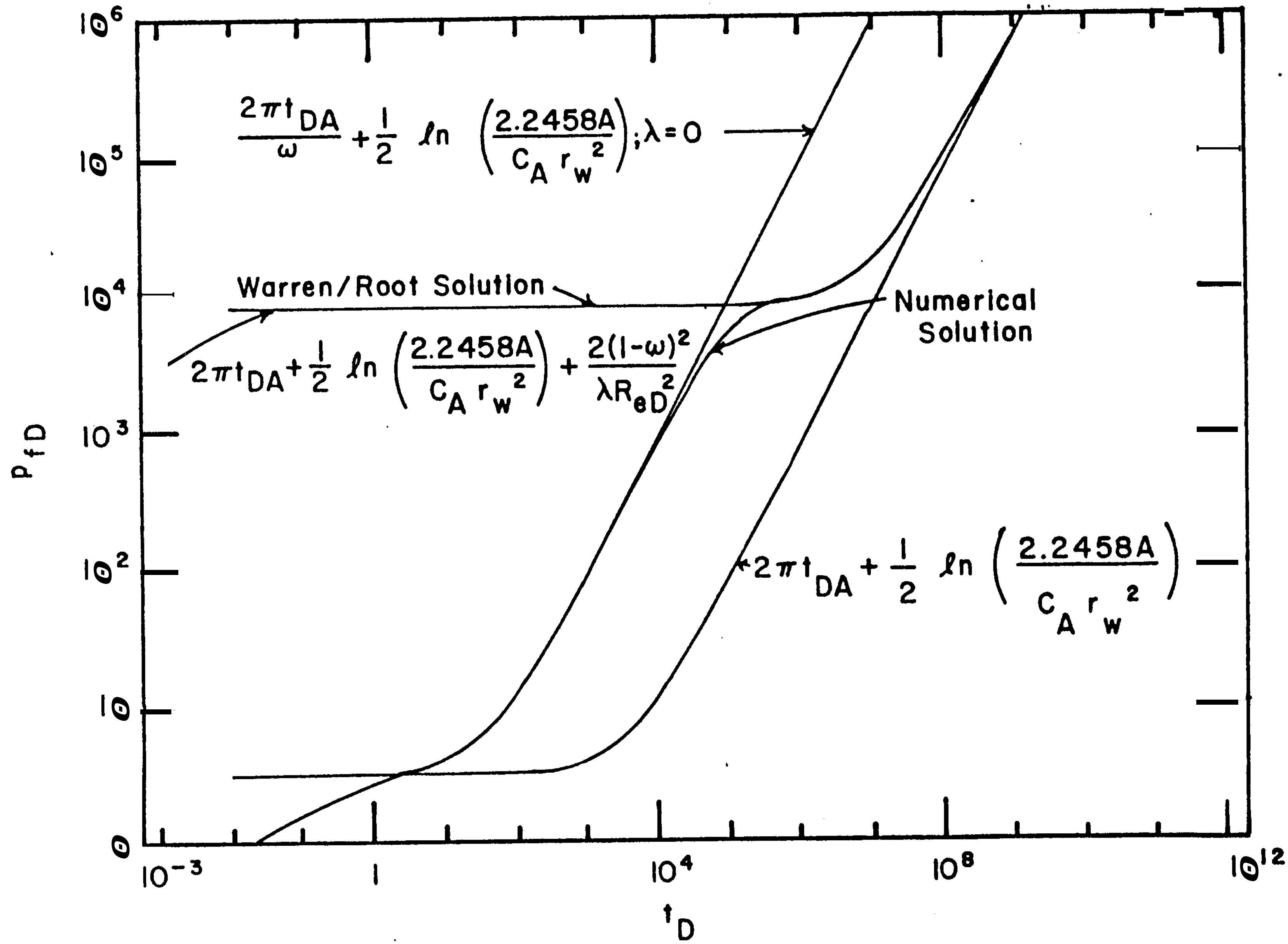

Fig. 3-3: DIMENSIONLESS WELLBORE PRESSURE VS DIMENSIONLESS TIME FOR A WELL PRODUCING AT CONSTANT FLOWRATE, $\omega = 0.01$, $\lambda = 10^{-7}$, $C_D = 0$. skin effect = 0, LINEAR APPROXIMATIONS

Eq. 3-15 for large values of t_{AD}. The exponential term becomes negligible, and the solution is given by:

$$p_{fwD} = 2\pi t_{AD} + \frac{1}{2}\ln\left(\frac{2.2458A}{C_A r_w^2}\right) + \frac{2\pi(1-\omega)^2}{\lambda A} \qquad (3\text{-}19)$$

The linear expressions as given by Eqs. 3-18 and 3-19 can be used to represent the entire solution after $t_{AD}/\omega \geq 0.1$. Figure 3-3 shows the solution for the dimensionless wellbore pressure for the case where $\omega = 0.01$, and $\lambda = 10^{-7}$. From an engineering point of view, the solution can be represented by the infinite solution before $t_{AD}/\omega = 0.1$, and by:

$$p_{fwD} = \frac{2\pi t_{AD}}{\omega} + \frac{1}{2}\ln\left(\frac{2.2458A}{C_A r_w^2}\right) \qquad \text{for} \quad 0.1 \leq t_D \leq \frac{\omega(1-\omega)}{\lambda} \qquad (3\text{-}20)$$

and

$$p_{fwD} = 2\pi t_{AD} + \frac{1}{2}\ln\left(\frac{2.2458A}{C_A r_w^2}\right) + \frac{2(1-\omega)^2}{\lambda r_{eD}^2} \qquad (3\text{-}21)$$

$$\text{for} \quad t_D \geq \frac{\omega(1-\omega)}{\lambda}$$

3.3 PRESSURE BUILDUP ANALYSIS

Since 1950, much effort has been devoted to development of pressure buildup analysis methods. The common technique requires shutting in a producing well (producing at constant rate). The pressure is measured just before shut-in, and is recorded as a function of time during the shut-in period. The main objective is to obtain reservoir properties such as static pressure, permeability, and formation damage or skin effect from the pressure buildup graph.

For homogeneous systems this method has been used with success for both infinite and finite systems, as described by Earlougher (1977). However, for two-porosity systems, the interpretation of buildup tests has been the subject of controversy by many authors. For example, see Pollard (1959), Warren and Root (1963), and Kazemi (1969).

Two of the most widely used methods in the interpretation of pressure buildup data for two-porosity systems are the Horner method using the Warren and Root model for interpreting the pressure buildup curves and the other is the Pollard method. The application of the Horner method and its limitations have been discussed by Crawford, et al. (1976). The Pollard method is based on a graph of $\log(\bar{p}-p_{ws})$ vs Δt. The Pollard method has been challenged because of some apparent errors or approximations in the mathematical model. However, this method is still used in many places.

In the present study a new method was developed. It is based on the extended Muskat analysis (Russell, 1966) for homogeneous systems. The method involves a semilog graph of the dimensionless pressure difference $\log(\bar{p}-p_{ws})_D$ vs dimensionless shut-in time, Δt_{AD}. Using this method, the permeability-thickness product can be obtained.

In the next sections a brief discussion for each of the two methods is presented and the new method is presented in detail.

3.3.1 HORNER PLOT

In his original work, Horner (1951) proposed a method based on graphing bottom-hole pressure against the logarithm of the time rates, $\left(\frac{t_s + \Delta t}{\Delta t}\right)$. From the slope of such a curve, it is possible to determine the permeability-thickness of the formation. Ramey and Cobb (1970) presented an extensive analysis of the applicability of the Horner method, as well as other methods to analyze pressure buildup tests for a well in a closed drainage area producing from a homogeneous system.

For a two-porosity system, Warren and Root presented analytical expressions to analyze a Horner graph for both a finite, and an infinite system. Crawford, et al. (1976) (based on the Warren and Root model) concluded that a pressure buildup equation can be obtained for a two-porosity system using the superposition principle in the same manner as it is used for a homogeneous system. As a concluding remark, it was pointed out that in a two-porosity system, the early and late-time data are the most important. Figure 3-4 shows a Horner plot for a two-porosity system where $\omega = 0.01$ and $\lambda = 5.10^{-7}$ ($C_D = 0$ and skin factor = 0) for a well producing from an infinitely large system. As expected from the Warren and Root model, a double-slope (S-shape) is observed. The slope m is 1.115, as for homogeneous systems. The double-slope type of behavior is not always present, and depends on production time as well as wellbore storage effects. Mavor and Cinco-Ley (1979) observed that for production times where the effective storativity, (ϕc_t), is less than the total reservoir storativity, $[(\phi c)_m + (\phi c)_f]$, the double-slope behavior *is* not present. Figure 3-5 shows the wellbore storage effect on the buildup curve for a two-porosity system where $\omega = 0.01$, and $\lambda = 5.10^{-7}$. The effect of different values of C_D *is* shown. It is seen that low values of C_D have a large impact on the initial straight line making impossible the evaluation of ω. For large values of C_D, not only the initial straight line, but also the transition zone is obscured by wellbore storage. For $C_D = 10^6$, the effect is so dominant that buildup data do

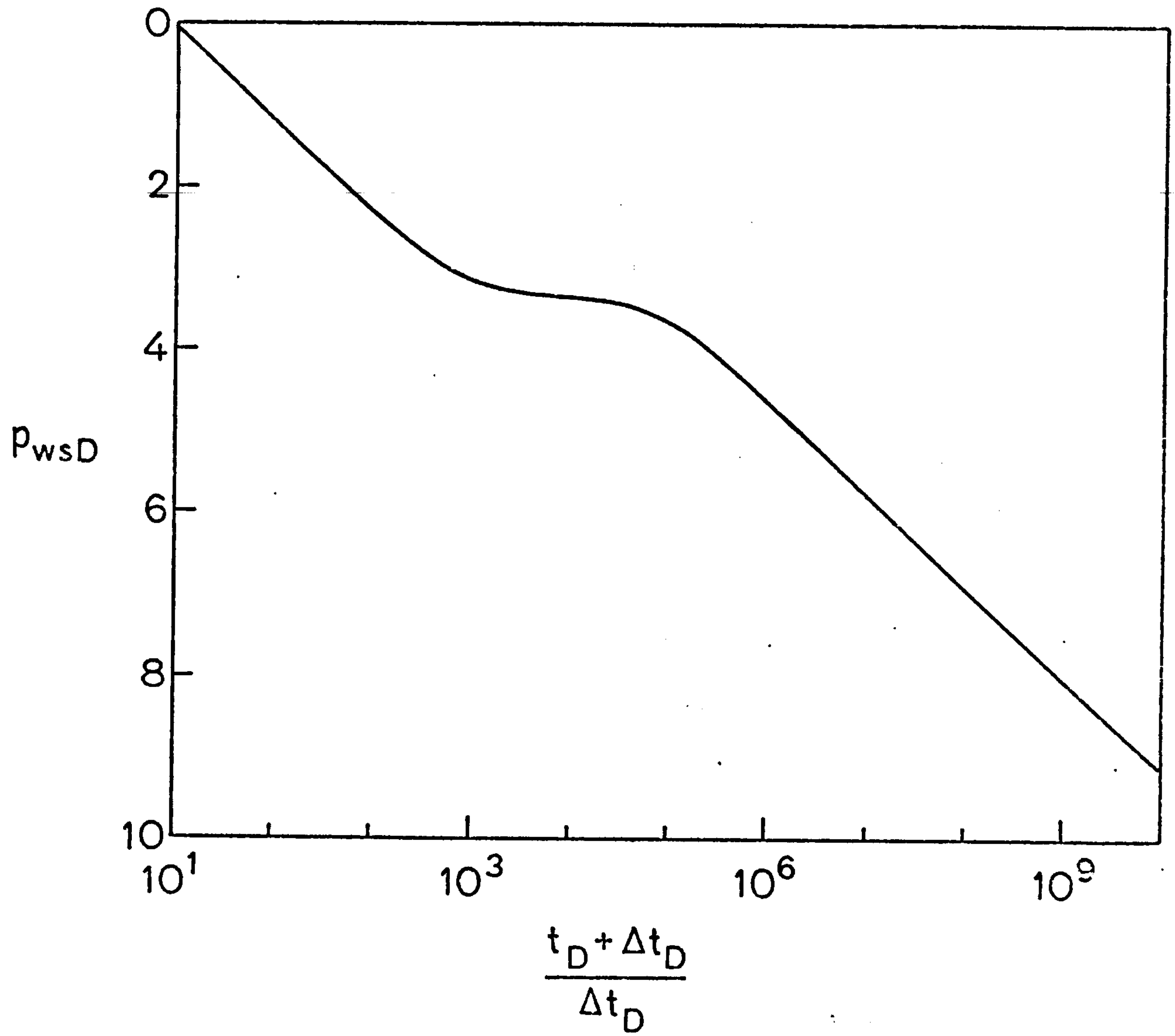

Fig 3-c: HORNER GRAPH FOR A WELL IN THE CENTER OF AN INFINITE CIRCULAR TWO-POROSITY SYSTEM (ω = 0.01, $\lambda = 5x10^{-7}$, skin effect = 0, C_D = 0)

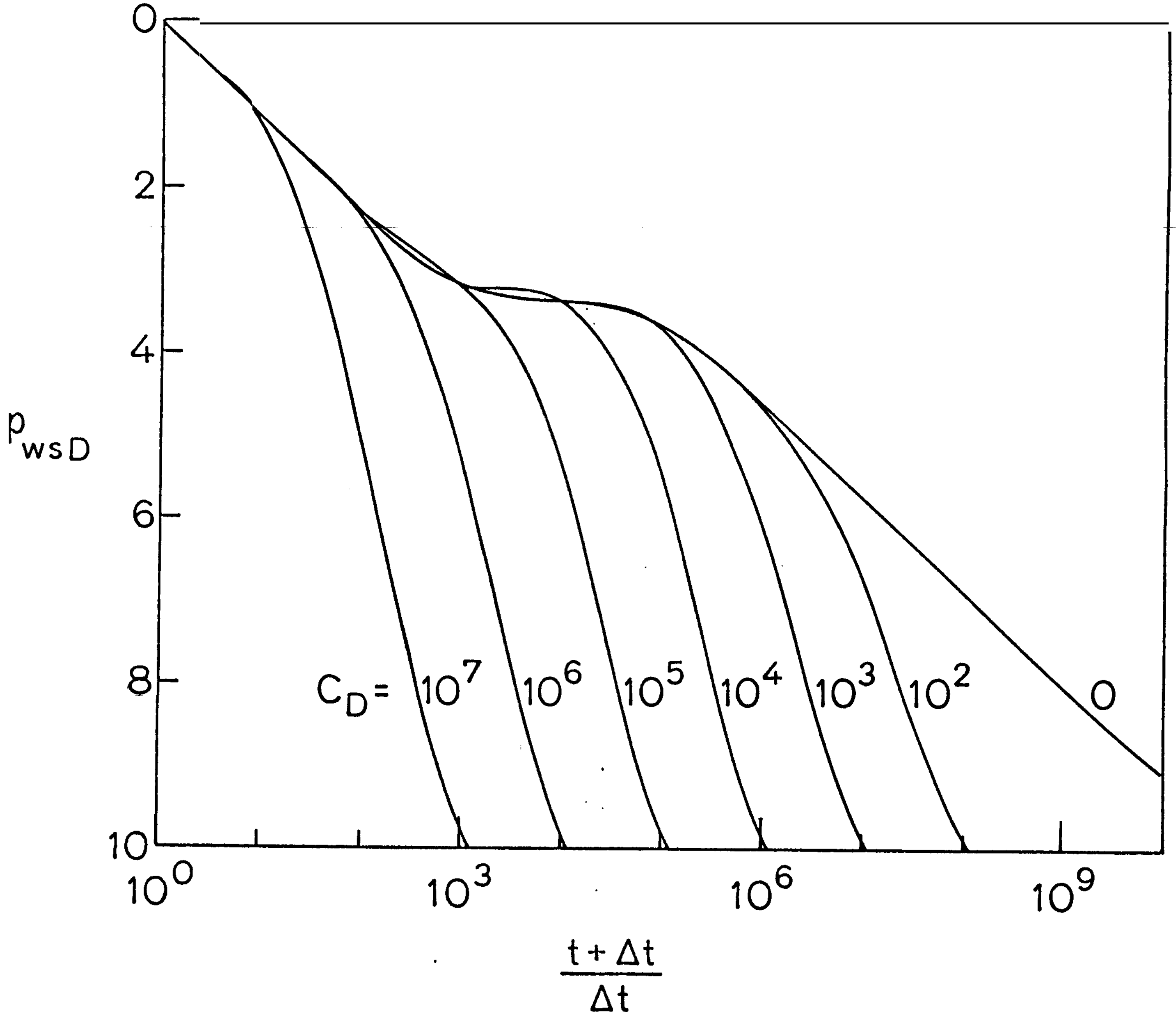

Fig. 3-5: WELLBORE STORAGE EFFECT IN HORNER BUILDUP, INFINITE, TWO-POROSITY SYSTEM (ω = 0.01, λ = $5x10^{-7}$, skin effect = 0)

not show the, fact that a two-porosity system is present. According to Mavor and Cinco-Ley (1979), to calculate ω and λ from field data, the following candition for C_D must be met for one log cycle of the early time behaviar to appear:

$$C_D \leq \frac{\omega(1-\omega)}{36\lambda(60+3.5S)} \qquad (3-22)$$

In the next section a brief analysis of the Pollard method is presented.

3.3.2 <u>POLLARD PLOT</u>

The Pollard method (1959) involves a semilog graph of $\log(\overline{p}-p_{ws})$ vs Δt. A typical graph is shown in Fig. 3-6. The interpretation of this method is based on the following equation:

$$\overline{p} - p_{ws} = C\, e^{-a_1 \Delta t} + D\, e^{-a_2 \Delta t} + (p-p_{wf}-C-D)\, e^{-a_3 \Delta t} \qquad (3-23)$$

Equation 3-23 can be expressed in dimensionless form as:

$$(\overline{p}-p_{ws})_D = C_D\, e^{-a_{1D}\pi r_{eD}^2 \Delta t_{AD}} + D_D\, e^{-a_{2D}\pi r_{eD}^2 \Delta t_{AD}} + (p-p_{wf}-C-D)_D\, e^{-a_{3D}\pi r_{eD}^2 \Delta t_{AD}} \qquad (3-24)$$

The constants C, D, a_1, a_2 and a_3 are obtained from the slopes and the ordinate intercepts as shown in Fig. 3-6. These constants are related to the permeabilities and the pore volumes of the matrix and fractures in the reservoir. The skin effect can also be obtained from such a graph. The Pollard technique assumes a system at pseudosteady state, and no

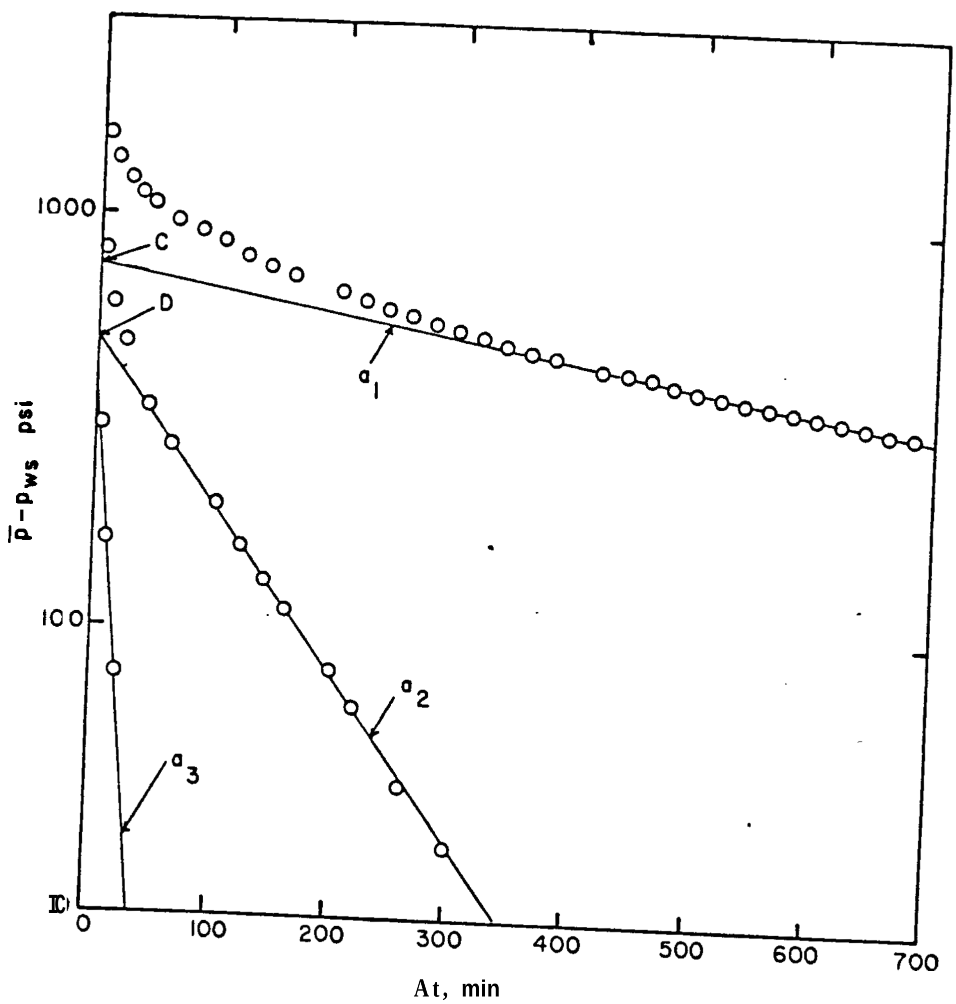

Fig. 3-6: POLLARD PLOT

particular gemoetry is involved. A comparison of the Pollard method with the extended Muskat analysis is made in the next section.

3.3.3 THE EXTENDED MUSKAT METHOD

A method to determine the permeability-thickness product for a two-porosity reservoir is considered here. The extended Muskat (1937) method, Russell (1966), employs a semilog plot of log $(\bar{p}-p_{ws})$ vs Δt. The permeability-thickness product is calculated using values from the ordinate intercept and the slope. The method theory is based on the extended Muskat analysis for homogeneous reservoirs, and the Warren and Root model for naturally-fractured reservoirs. Using basic pressure buildup equations and a volumetric balance for a closed reservoir of area A, the following relation can be used to study a Muskat plot:

$$\frac{kh}{141.2\ qB\mu}(\bar{p}-p_{ws}) = p_D(t+\Delta t)_D - p_D(\Delta t_D) - 2\pi t_{AD} \qquad (3\text{-}25)$$

Any appropriate set of p_D data can be used in Eq. 3-25 to generate a Muskat-type buildup. For homogeneous systems the nature of this equation has been extensively studied by Ramey and Cobb (1971). To extend the method for naturally-fractured systems, the corresponding expressions for the dimensionless wellbore pressure, p_D, are needed. This is accomplished using the Laplace space solution presented as Eq. 3-11 in Section 3.2.2 and numerically inverting to obtain p_D. In addition, analytical expression for p_D was presented by Warren and Root as Eq. 3-15. This expression is valid only when the system is at pseudosteady state prior to shut-in. The solution to Eq. 3-25 is shown in Fig. 3-7. Several curves are shown depending on the production time, t_{AD}. All of the curves correspond to the case where $\omega = 0.01$ and $\lambda = 10^{-4}$. A well defined

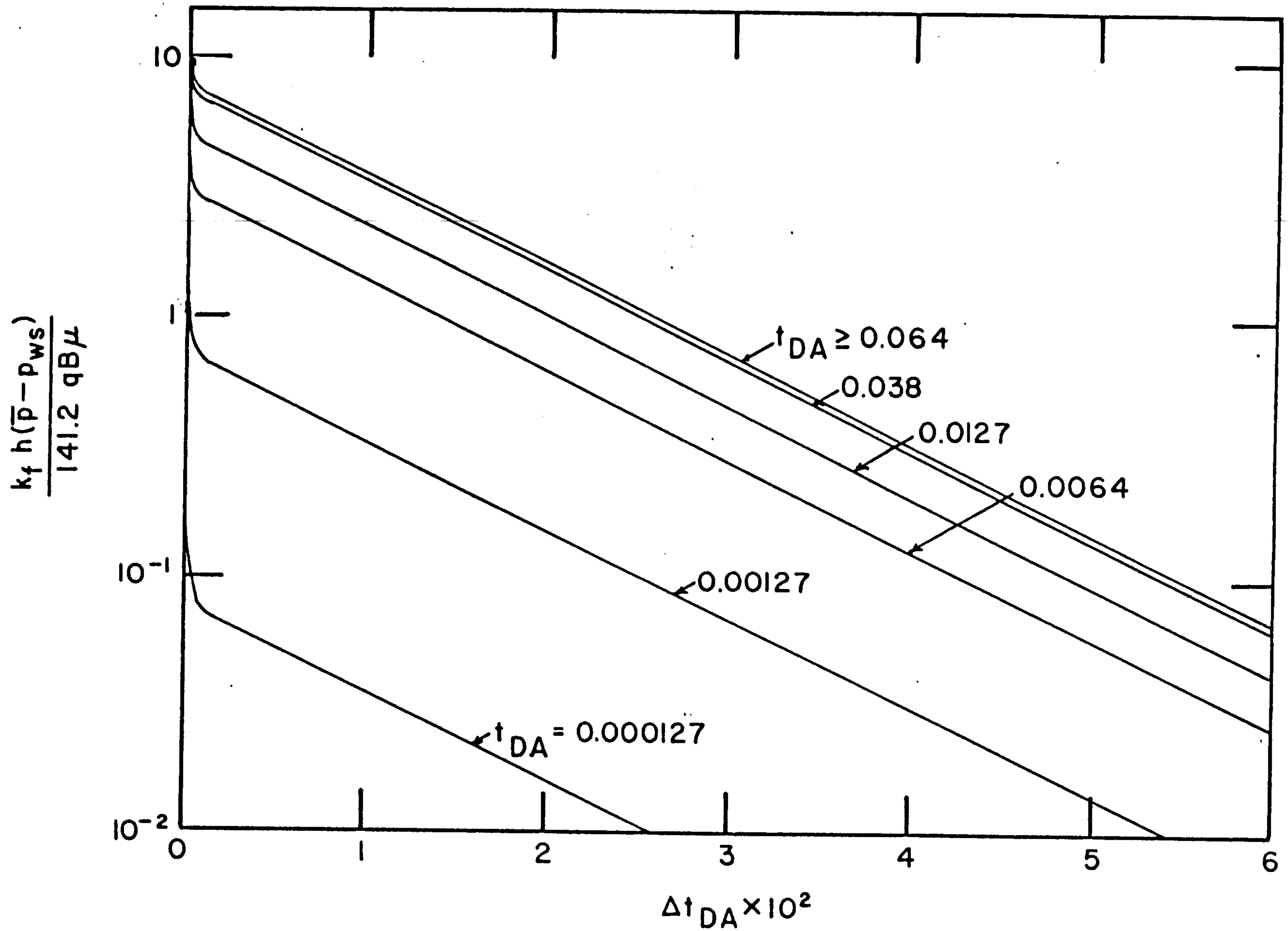

Fig. 3-7: MUSKAT PLOT FOR A FRACTURED SYSTEM ($\omega = 0.01$, $\lambda = 10^{-6}$)

straight line is observed in all the curves shown. The same behavior is observed for homogeneous systems as pointed out by Ramey and Cobb (1971). For productton times t_{AD} equal to orlargerthan *0.064* only one curve is obtained.

The solution for a homogeneous system or fracture porosity (no matrix porosity) reservoir is a particular case of the two-porosity system. **It** is obtained by setting $\omega = 1$ in **Eq.** 3–11. **Fig.** 3–8 shows the solution for comparison with a fractured reservoir in the case where $w = 0.01$, $\lambda = 10^{-6}$ and for a production time $t_{AD} = 0.127$. The homogeneous solution is the same as the solution presented by Russell (1966). ***This*** is a good check of the validity of the algorithm used for numerical inversion. According to Fig. 3–8, for a fractured reservoir, the development of the straight line occurs earlier in shut–in time than the homogeneous reservoir case.

To explain the observed behavior, the analytical expression of p_{fwD} presented by Warren and Root given as **Eq.** 3–15 **can** be used. Substituting Eq. 3–15 in Eq. 3–25, the following expression is obtained:

$$\frac{k_f h}{141.2\, qB\mu}(\bar{p}-p_{ws}) = \frac{2t_D}{r_{eD}^2(r_{eD}^2-1)} + \frac{2(1-\omega)^2}{(r_{eD}^2-1)\lambda}\, e^{-\frac{\lambda \Delta t_D}{\omega(1-\omega)}}\left(1 - e^{-\frac{\lambda t_D}{\omega(1-\omega)}}\right) \qquad (3\text{–}26)$$

Normally, $r_{eD}^2 \gg 1$, and using the definition $t_{AD} = t_D/(A/r_w^2)$, Eq. **3–26** reduces to:

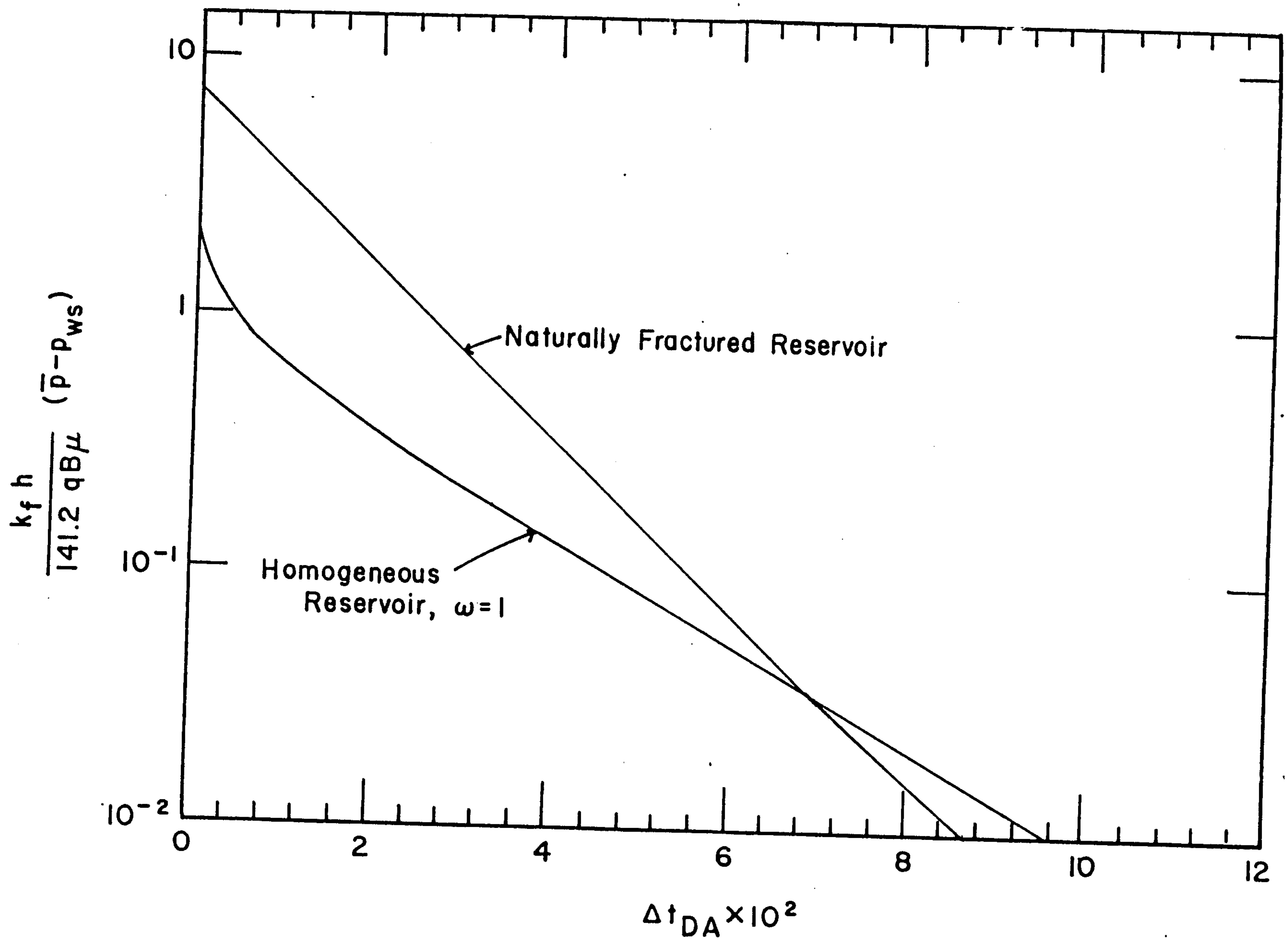

Fig. 3-8: MUSKAT GRAPH: COMPARISON OF FRACTURED AND HOMOGENEOUS RESERVOIR SOLUTIONS (ω = 0.01, λ = 10^{-6}, and t_{AD} = 0.127)

$$\frac{k_f h}{141.2\ qB\mu}\left(\bar{p}-p_{ws}\right) = \frac{2\pi t_{AD}}{r_{eD}^{2}} + \frac{2(1-\omega)^2}{\lambda r_{eD}^{2}}\ e^{-\frac{\lambda A\ \Delta t_{AD}}{\omega r_w^{2}(1-\omega)}}\left(1 - e^{-\frac{\lambda A t_{AD}}{\omega r_w^{2}(1-\omega)}}\right) \tag{3-27}$$

The term $2\pi t_{AD}/r_{eD}^2$ is negligible compared to the other terms in Eq. 3–27 for most cases of interest. Then Eq. 3–27 reduces to:

$$\frac{k_f h}{141.2\ qB\mu}\left(\bar{p}-p_{ws}\right) = \frac{2(1-\omega)^2}{\lambda r_{eD}^{2}}\ e^{-\frac{\lambda A\ \Delta t_{AD}}{w r_w^{2}(1-\omega)}}\left(1 - e^{-\frac{\lambda A t_{AD}}{w r_w^{2}(1-\omega)}}\right) \tag{3-28}$$

Taking the logarithm of both sides of Eq. 3–28 yields:

$$\ell n\ \frac{k_f h}{141.2\ qB\mu}\left(\bar{p}-p_{ws}\right) = \ell n\ \frac{2(1-\omega)^2}{\lambda r_{eD}^{2}}\left(1 - e^{-\frac{\lambda A t_{AD}}{w r_w^{2}(1-\omega)}}\right) - \frac{\lambda A}{\omega(1-\omega) r_w^{2}}\ \Delta t_{AD} \tag{3-29}$$

Equation 3–29 can be used to interpret the observed behavior shown in Fig. 3–7. For any production time, t_{AD}, a graph of $\ell n\ \frac{k_f h}{141.2\ qB\mu}\left(\bar{p}-p_{ws}\right)$ vs At, should be a straight line with a slope m_D equal to:

$$m_D = \frac{XA}{\omega(1-\omega) r_w^{2}} \tag{3-30}$$

and intercept with the ordinate equal to:

$$\frac{2(1-\omega)^2}{\lambda r_{eD}^2}\left(1 - e^{-\frac{\lambda \Delta t_{AD}}{\omega r_w^2 (1-\omega)}}\right) \qquad (3\text{–}31)$$

In Fig. 3–7 all the curves shown have the same slope m_D and an intercept dependent on the production time t_{AD}. For production times t_{AD} such that the term exp $\left(\lambda \Delta t_{AD} \ldots\right)$ is negligible in Eq. 3–29, a simple relation is obtained valid when the system is produced long enough to reach pseudosteady state:

$$\ln \frac{k_f h}{141.2\, qB\mu}(\bar{p}-p_{ws}) = \ln \frac{2(1-\omega)^2}{\lambda r_{eD}^2} - \frac{\lambda A}{\omega(1-\omega) r_w^2} \Delta t_{AD} \qquad (3\text{–}32)$$

The behavior represented by Eq. 3–32 is shown in Fig. 3–7 for the case where $t_{AD} \geq 0.064$.

For a homogeneous reservoir, a Muskat graph provides a simple way to find the permeability-thickness product for a reservoir. In a similar manner, Eq. 3–32 suggests a method to find the product $k_f h$ for a naturally-fractured reservoir.

Considering the system at pseudosteady state, the intercept in a Muskat plot is given by Eq. 3–32 with $\Delta t_{AD} = 0$:

$$\frac{k_f h}{141\, qB\mu}(\bar{p}-p_{ws})_{\Delta t=0} = \frac{2(1-\omega)^2}{\lambda r_{eD}^2} \qquad (3\text{–}33)$$

Normally ω and λ are obtained independently from pressure buildup analysis (see, Crawford et al. (1976)). The product $k_f h$ can be obtained by solving Eq. 3-33:

$$k_f h = \frac{141.2\ qB\mu}{(\bar{p}-p_{ws})_{\Delta t=0}} \frac{2(1-\omega)^2}{\lambda r_{eD}^2} \qquad (3\text{-}34)$$

where the pressure difference $(\bar{p}-p_{ws})$ is obtained from the ordinate intercept at a shut-in time of zero. Comparing Eq. 3-34 with the equation used to find $k_f h$ for a homogeneous reservoir as presented by Ramey and Cobb, ω and λ completely define the flow behavior of a naturally-fractured reservoir.

The Pollard method and the technique presented herein are similar. This is observed by comparing Eqs. 3-24 and 3-28. In fact, the parameters ω and λ can be related to the Pollard constants C_D, D_D, a_{1D}, a_{2D}, and a_{3D}. These constants are defined in the nomenclature. However, from a physical point of view, the meaning of such a relation is not clear. For instance, in the presented method, the calculated values for permeability are valid for a well centered in a closed circle. A geometry such as a well centered in a closed square will change the ordinate intercept. For a homogeneous system the ordinate intercept is equal to 0.67 for a well in a closed square, but it is 0.83 for a well in a closed circle. The Pollard technique assumes a system at pseudosteady state. The same assumption was made in the presented technique because it leads to simple expressions. However, even if the system is not a pseudosteady state, the Muskat analysis can be applied by using Eq. 3-37, knowing the production time,. t_{AD}.

3.4 INTERFERENCE ANALYSIS

Interference tests can be used to provide information such as mobility-thickness product, $\frac{kh}{\mu}$, and the porosity-compressibility-thickness product, $\phi c_t h$. Basically, an interference test involves a long duration rate modification in an observation well that can be analyzed for reservoir properties. For homogeneous systems, such a test has been used with success in many cases. See, for example, Earlougher (1977).

The analysis of interference tests in two-porosity systems has been the subject of study for many years. Kazemi (1969), based on the two-porosity model of Warren and Root, presented results for the fracture-pressure distribution in the reservoir. In Kazemi's work, the wellbore response to an interference test is dependent on the pressure variations in the fractures, rather than in the matrix. Hence, this study is limited to the case where the wells used in the test are completed in the fractures. Stneltsova-Adams (1976) considered both fracture and matrix pressure distribution and pointed out the importance of differencing matrix flow and fracture flow in the analysis of tests made on fractured formations. Both types of flow are characteristic of the flow behavior encountered in naturally-fractured reservoirs.

Recently, Deruyck (1980), presented the dimensionless fracture and matrix pressure distributions in the form of log-log type-curves which can be used to interpret interference tests. In addition, the solution for a well producing at a constant inner pressure was presented. The results presented by Deruyck for the matrix and fracture-pressure distribution agree with the ones presented by Streltsova-Adams, in the main. There are some significant differences which Deruyck attributed to Streltsova-Adams's evaluation of inversion integrals.

Figure 3-9 shows the solution for the dimensionless fracture pressure vs t_D/r_D^2 for several values of ω , and θ . The parameter θ is equal to λr_D^2 . It was found to be a correlating group. It allows different values of λ to be represented by only one curve. This reduces the number of type curves to be used in a type-curve matching. The case $\omega = 1$ corresponds to the homogeneous reservoir and is shown for comparison with a fracture system. The observed behavior in the dimensionless formation pressure p_{fD} is similar to the previously-studied cases. The dependence on t_D/r_D^2 and ω at short times and the solution approaches the homogeneous case for long times. The Laplace space solution for the dimensionless wellbore pressure p_{fD} is given in Appendix A:

$$\overline{p_{fD}} = \frac{K_0\left(\sqrt{sf(s)}\ r_D\right)}{s\sqrt{sf(s)}\ K_1\left(\sqrt{sf(s)}\right)} \qquad (3-35)$$

For early times, Eq. 3-35 can be approximated by the relation:

$$\overline{p_{fD}} = \frac{K_0\left(\sqrt{\omega s}\ r_D\right)}{s\sqrt{\omega s}\ K_1\left(\sqrt{\omega s}\right)} \qquad (3-36)$$

which, upon inversion, yields the following short time approximation for p_{fD} :

$$p_{fD} = 2\left(\frac{t_D}{\omega r_D}\right)^{1/2}\left[\mathrm{i\ erfc}\left(\frac{r_D - 1}{2\sqrt{t_D/\omega}}\right)\right] \qquad (3-37)$$

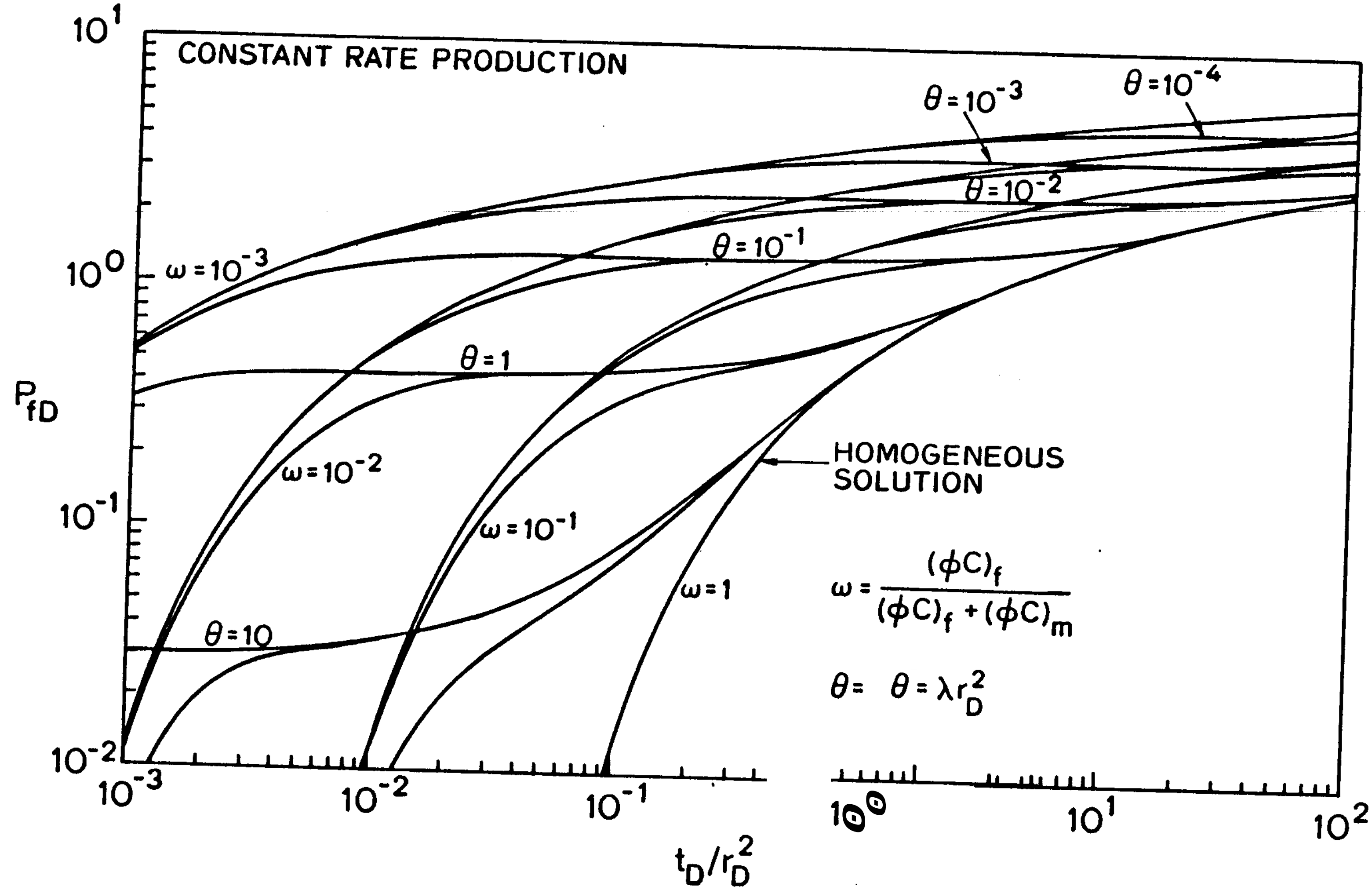

Fig. 3-9: P_{fD} VS t_D/r_D^2 FOR A WELL PRODUCING AT CONSTANT FLOWRATE FROM AN INFINITELY LARGE, NATURALLY-FRACTURED RESERVOIR

The solution for the dimensionless matrix pressure is shown in Fig. *3-10* for several values of the parameters θ $(= \lambda r_D{}^2)$ and ω. The line-source solution $(\omega = 1)$ is shown for comparison. The Laplace space solution for the dimensionless matrix pressure, p_{mD}, is given in Appendix A:

$$\overline{p_{mD}} = \frac{\lambda K_0\left(\sqrt{sf(s)}\; r_D\right)}{\left((1-\omega)s + \lambda\right)\left[s\sqrt{sf(s)}\; K_1\left(\sqrt{sf(s)}\right)\right]} \qquad (3\text{-}38)$$

As shown in Appendix A, a short time approximation yields the following relation:

$$\overline{p_{mD}} = \frac{\lambda}{(1-\omega)\sqrt{\omega r_D}} \; \frac{1}{s^{5/2}} \; e^{-(r_D-1)\sqrt{\omega}\,\sqrt{s}} \qquad (3\text{-}39)$$

which upon inversion yields:

$$p_{mD} = \frac{\lambda\omega r_D}{(1-\omega)}\left(\frac{4t_D}{wr_D}\right)^{3/2} i^3\,\mathrm{erfc}\left(\frac{r_D - 1}{2\sqrt{t_D/\omega}}\right) \qquad (3\text{-}40)$$

A special case of Eq. *3-40* arises when $\omega = 0$. Similar to the constant inner producing pressure solution, the relationship for p_{mD} and t_D is simple at short times for $\omega = 0$:

$$p_{mD} = \sqrt{\lambda}\,\frac{K_0\left(\sqrt{\lambda}\, r_D\right)}{K_1\left(\sqrt{\lambda}\right)}\; t_D \qquad (3\text{-}41)$$

Eq. *3-41* can be used to interpret the unit slope behavior for p_{mD} shown on Fig. *3-10.* As discussed in the previous section, the linear behavior

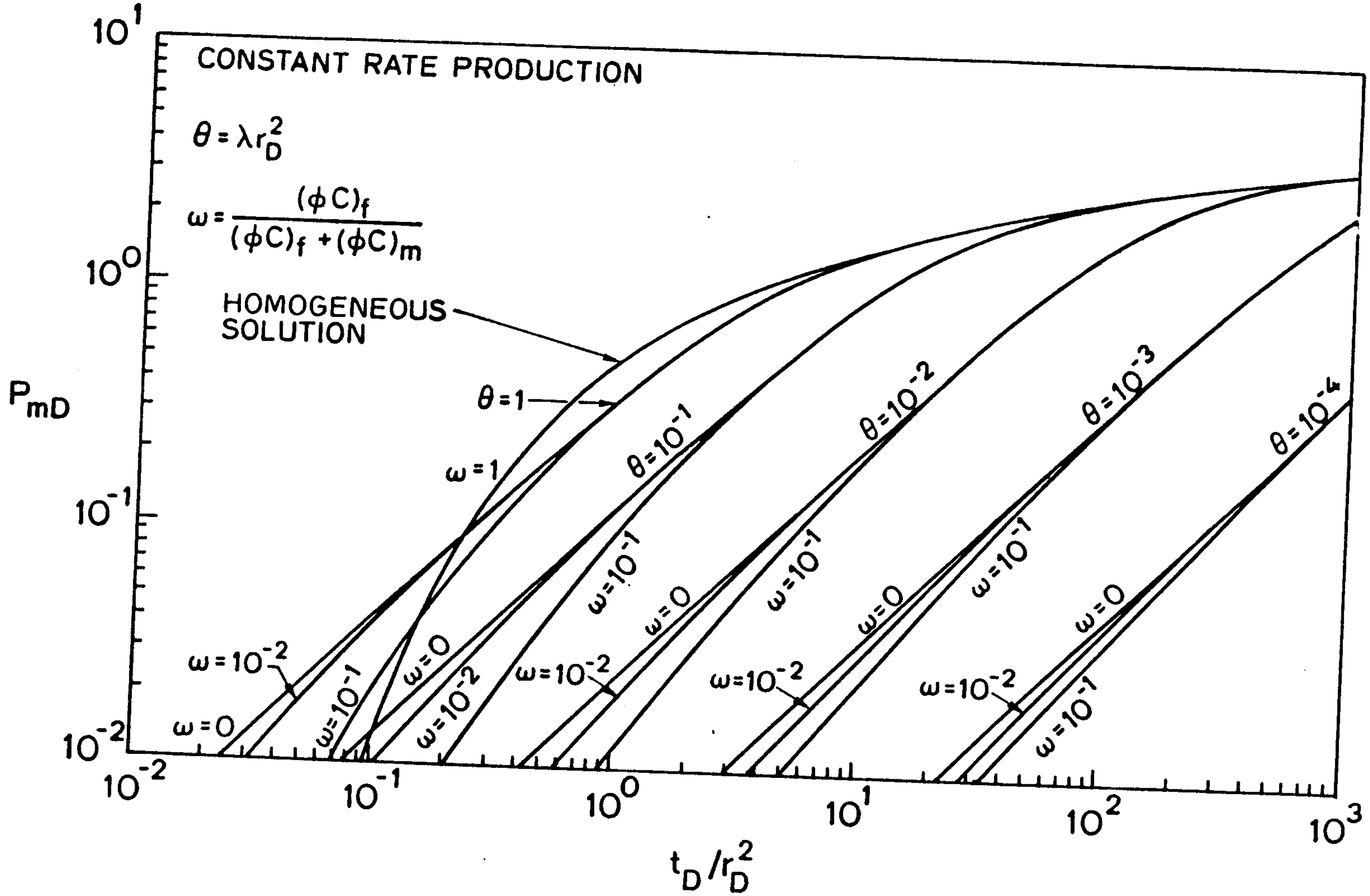

Fig. 3-10: P_{mD} VS $t_D/r_D{}^2$ FOR A WELL PRODUCING AT A CONSTANT FLOWRATE FROM A NATURALLY-FRACTURED RESERVOIR

should not be associated with a wellbore storage effect. It is characteristic of a naturally-fractured system as expressed mathematically by Eq. 3-41. At long times, Eq. 3-38 is the same as the Laplace space solution for the dimensionless fracture pressure solution. That is, as time increases, the matrix and fracture pressures agree. At long times, the matrix solution and the fracture solution are the same as the line-source solution.

3.5 INTERFERENCE ANALYSIS USING TYPE-CURVES

Type-curve matching can be applied to interference-test analysis in the same manner as it was applied to decline curve analysis in the previous section. For homogeneous systems, type-curve matching is simpler for interference testing than for single-well testing, because there is only one type-curve. ($\omega = 1$ in Fig. 3-9) to consider for infinite-acting systems. For naturally-fractured systems, there is more than one type-curve as shown in Fig. 3-9. However, the number of interference type-curves is not as large as the number required for decline curve analysis. In fact, the parameter $\theta = \lambda r_D^2$ allows different values of λ to be represented by the same curve. Furthermore, for a given match, ω and λ are obtained directly using Fig. 3-9. From the definitions of θ, p_{fD}, t_D/r_D^2, and ω, the fracture permeability, k_f, total storativity, A, and the product αk_m can be calculated using the equations:

$$k_f = \frac{141.2\, qB\mu}{h}\left(\frac{p_{fD}}{\Delta p}\right)_M \qquad (3\text{-}42)$$

$$[(\phi c)_f + (\phi c)_m] = \frac{0.000264\ k_f}{r_2}\left(\frac{t}{t_D/r_D^2}\right)_M \qquad (3\text{-}43)$$

$$(\phi c)_{f^*} = [(\phi c)_f + (\phi c)_m]\,\omega \tag{3-44}$$

$$(\alpha k_m) = \frac{\theta\, k_f}{r^2} \tag{3-45}$$

In the next section, a simulated water injec ion test wil: be presented.

3.6 INTERFERENCE EXAMPLE

The use of type-curve matching will be illustrated with a simulated injection test. During an interference test, water was injected into a well for *430* hours. The pressure response in a well 250 ft away was observed during the injection process. Reservoir properties and the observed pressure data are given in Table 3.2. The pressure change was graphed as a function of time on tracing paper and then placed over Fig. 3-9 (see Fig. 3-11). From the match, ω and θ can be obtained as parameters. From Fig. 3-11, $\theta = 1$ and $\omega = 0.01$. The fracture permeability is obtained using Eq. 3-42:

$$k_f = \frac{141.2\, qB\mu}{h}\left(\frac{p_{fD}}{\Delta p}\right)_M = \frac{141.2\,(-100)\,(1)(1)}{480}\;\frac{0.4}{(-10)}$$

$$= 1.2 \text{ md}$$

From the time-t_D/r_D^2 match, the total storativity is obtained using Eq. 3.43:

$$[(\phi c)_f + (\phi c)_m] = \frac{0.000264\; k_f}{r^2}\left(\frac{t}{t_D/r_D^2}\right)$$

$$= \frac{0.000264\,(1.2)}{(250)}\left(\frac{100}{1.5}\right)$$

$$= 3.38\times10^{-7}\ \text{psi}^{-1}$$

Table 3-2

q = -100 B/D

h = 480 ft

p_i = 0

t_{inj} = 400 hr

r = 250 ft

B_w = 1.0 RB/STB

μ_w = 1 cp

t hours	p_w (psig)	$\Delta p = p_i - p_w$ (psi)
0.0	0	---
4.7	11	-11
6.7	11	-11
11.5	12	-12
16.5	12.5	-12.5
26.5	13.5	-13.5
46	15.5	-15.5
65	17	-17
98	19.5	-19.5
135	22	-22
200	26	-26
265	29	-29
400	33.5	-33.5

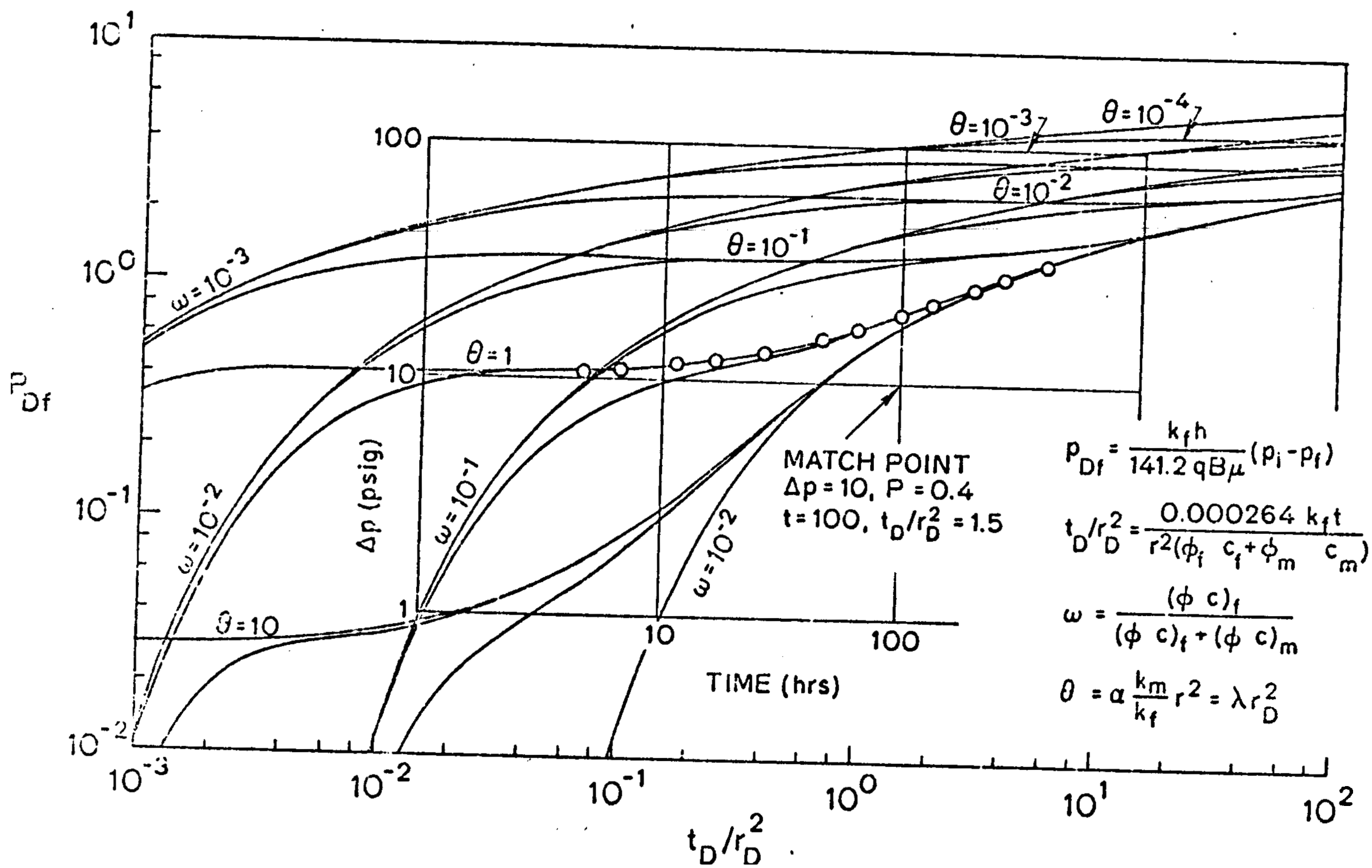

Fig 3-11 TYPE-CURVE MATCH FOR INTERFERENCE EXAMPLE

From $\omega = 1$ and the total storativity, the fracture storativity can be obtained using Eq. 3-44:

$$(\phi c)_f = [(\phi c)_f + (\phi c)_m]$$

$$= (0.01)[3.38\times10^{-7}] = 3.38\times10^{-9}\ psi^{-1}$$

as $\theta = \lambda r_D^2 = 1$:

$$\lambda = \frac{\theta}{r_D^2} = \frac{1}{(1000)^2} = 10^{-6}$$

also from the relation $\theta = \alpha \frac{k_m}{k_f} r^2$:

$$\alpha k_m = \frac{\theta\ k_f}{r^2}$$

$$- \frac{(1)(1.2)}{(250)^2} = 1.9\times10^{-5}\ md/ft^2$$

Thus, if k_m can be obtained from core analysis, then the shape factor a is equal to:

$$a = \frac{1.9\times10^{-5}}{k_m}\ md\text{-}ft^{-2}$$

The shape factor α can provide information about the effective block size in the system.

4.0 CONCLUSIONS

This study concerns three important aspects of a naturally-fractured reservoir: decline curve analyses, pressure buildup analyses, and interferenie testing for both constant-rate production, and constant-pressure production. Transient rate analysis reveals that the initial rate decline is not always indicative of the final state of depletion for a naturally-fractured reservoir: the flowrate shows a rapid decline at first, and then becomes almost constant for a long period, after which a final decline in flowrate takes place. The fracture permeability and total storativity can be obtained using log-log type-curve matching. The procedure is similar to that for a homogeneous system.

Pressure buildup analysis provides a method to calculate the fracture permeability. The solutions obtained for analyzing interference data for both constant-rate and constant-inner-pressure production show that early-time data is needed for proper interpretation of such tests.

The following conclusions appear warranted:

1) The initial decline in-flow rate is often not representative of the final state of depletion.

2) Type-curve matching based on only the initial rate decline can yield erroneous values for the size of the system.

3) A long period of constant flowrate can be considered as an indication of a non-homogeneous system.

4) The fracture permeability, k_f ; total storativity, $[(\phi c)_m + (\phi c)_f]$; and the shape factor "α" can be obtained from type-curve matching.

5) More than one type-curve is necessary for the best match if ω and λ can not be obtained from pressure buildup analysis.

6) The extended Muskat analysis can be applied to naturally-fractured reservoirs. The permeability-thickness product, $k_f h$, can be obtained from a semilog graph of the pressure difference $(\bar{p} - p_{ws})$ vs shut-in time, Δt .

7) Both dimensionless matrix pressure and fracture pressure are necessary for proper analysis of interference tests.

8) For constant-rate production, interference tests can be analyzed at long times using the line-source solution.

9) In analyzing interference tests for constant-inner-pressure production, a different solution for the pressure distribution results for each value of radial distance, r_D. The pressure function does not correlate with the line-source solution.

NOMENCLATURE

A = drainage area, ft2

a_1, a_2, a_3 = slopes in Pollard method, cycle/hr

a_{1D} = dimensionless constant

$$\frac{[(\phi c)_m + (\phi c)_f]\mu r_w^2}{2.637\ 10^{-4}\ k}\ a_1$$

a_{2D} = dimensionless constant

$$\frac{[(\phi c)_m + (\phi c)_f]\mu r_w^2}{2.637\ 10^{-4}\ k}\ a_2$$

a_{3D} = dimensionless constant

$$\frac{[(\phi c)_m + (\phi c)_f]\mu r_w 2}{2.637\ 10^{-4}\ k}\ a_3$$

B = formation volume factor, RB/STB

C = ordinate intercept in Pollard method, psi

C_D = dimensionless ordinate intercept

$$\frac{kh}{141.2\ qB\mu}\ C$$

c = compressibility, psi-1

D = ordinate intercept in Pollard method, psi

D_D = dimensionless ordinate intercept

$$\frac{kh}{141.2\ qB\mu}\ D$$

h = formation thickness, ft

I_0 = modified Bessel function, first kind, zero order

I_1 = modified Bessel function, first kind, first order

K_0 = modified Bessel function, second kind, zero order

K_1 = modified Bessel function, second kind, first order

k = permeability, md

m_D = slope in Muskat method, dimensionless

$$\frac{\lambda A}{\omega(1-\omega) r_w^2}$$

p_{ws} = wellbore pressure during the build-up period, psi

$\overline{p}$ = average reservoir pressure, psi

p_D = dimensionless wellbore pressure

$$\frac{k_f h}{141.2\ qB\mu} (p_i - p_w)$$

$(\overline{p}-p_{ws})_D$ = dimensionless pressure difference

$$\frac{k_f h}{141.2\ qB\mu} (\overline{p} - p_{ws})$$

p_{fD} = dimensionless fracture pressure

p_{mD} = dimensionless matrix pressure

$\overline{p}_D$ = Laplace transform of p_D

q = volumetric rate, B/D

Q = cumulative production, bbl

q_D = dimensionless flowrate

$$\frac{141.2\ qB\mu}{k_f h\ (p_i - p_w)}$$

Q_D = dimensionless cumulative production

$\overline{q}_D$ = Laplace transform of q_D

$\overline{Q}$ = Laplace transform of Q_D

r = radius, ft

r_w = wellbore radius, ft

r_D = dimensionless radius, r/r_w

r_e = reservoir outer boundary radius, ft

r_{eD} = dimensionless outer boundary radius, r_e/r_w

r'_w = effective wellbore radius, $r_w \exp(-S)$, ft

r'_{eD} = effective dimensionless well outer boundary radius, r_e/r'_w

s = Laplace space variable

S = skin effect

t = time, hours

t_D = dimensionless time

$$= \frac{2.637 \; 10 \quad k_f t}{[(\phi c)_m + (\phi c)_f]\mu \, r_w^2}$$

$t_{AD} = \frac{t_D r_w^2}{A}$, dimensionless

Δt = shut-in time, hr

Δt_A = dimensionless shut-in time

$$= \frac{2.637 \; 10 \quad k_f \Delta t}{[(\phi c)_m + (\phi c)_f]\mu r_w^2}$$

$\Delta t_{AD} = \frac{\Delta t_D r_w^2}{A}$, dimensionless

Subscripts

f = fracture

m = matrix

D = dimensionless

Greek

μ = viscosity, cp

ϕ = porosity, fraction

a = interporosity flow shape factor, ft^{-2}

$\lambda = a \frac{k_m}{k_f} r_w^2$, dimensionless

$\omega = \frac{(\phi c)_f}{(\phi c)_f + (\phi c)_m}$, dimensionless

8 = hr, 2 , correlating group, dimensionless

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APPENDIX A

DERIVATION OF SOLUTION FOR THE CONSTANT FLOW RATE CASE

This appendix contains a derivation of the solution for the constant flow rate case, short and long-time approximations for the dimensionless wellbore pressure, and short and long-time approximations for the dimensionless formation fracture and matrix pressures.

A.1 DERIVATION OF SOLUTION FOR THE CONSTANT FLOW RATE CASE

Although a portion of the following development has been presented by several authors, the derivation is presented here for the sake of completeness. The fundamental partial differential equations for fluid flow in a two-porosity system are:

$$\frac{\partial^2 p_{fD}}{\partial r_D^2} + \frac{1}{r_D}\frac{\partial p_{fD}}{\partial r_D} = (1-\omega)\frac{\partial p_{mD}}{\partial t_D} + \omega\frac{\partial p_{fD}}{\partial t_D}, \qquad \text{(A-1)}$$

and

$$(1-\omega)\frac{\partial p_{mD}}{\partial t_D} = \lambda(p_{fD}-p_{mD}). \qquad \text{(A-2)}$$

The initial condition is given by:

$$p_{fD}(r_D,0) = p_{mD}(r_D,0) = 0 \qquad \text{(A-3)}$$

The wellbore storage condition is given by:

$$C_D \frac{\partial p_{fD}}{\partial t_D} - \frac{\partial p_{fD}}{\partial r_D} = 1 \tag{A-4}$$

The skin condition is:

$$p_{fwD} = \left(p_{fD} - S \frac{\partial p_{fD}}{\partial r_D} \right)_{r_D=1} \tag{A-5}$$

Two outer boundary conditions are considered: an infinitely-large reservoir, and a closed outer boundary. For an infinitely large reservoir:

$$\lim_{r_D \to \infty} p_{fD}(r_D, t_D) = 0 \tag{A-6}$$

For the closed outer boundary, the condition is:

$$\left. \frac{\partial p_{fD}}{\partial r_D} \right|_{r_D = r_{eD}} = 0 \tag{A-7}$$

Applying the Laplace transformation to Eqs. A-1 through A-5 results in the following equations in Laplace space:

$$\frac{\partial^2 \overline{p}_{fD}}{\partial r_D^2} + \frac{1}{r_D} \frac{\partial \overline{p}_{fD}}{\partial r_D} = s(1-\omega)\overline{p}_{mD} + s\omega\overline{p}_{fD} \tag{A-8}$$

$$(1-\omega)\, s\, \overline{p}_{mD} = \lambda(\overline{p}_{fD} - \overline{p}_{mD}) \tag{A-9}$$

$$\overline{p}_{fD} = \overline{p}_{mD} = \tag{A-10}$$

$$C_D \, s \, \overline{p}_{fwD} - \left(\frac{\partial \overline{p}_{fD}}{\partial r_D}\right)_{r_D=1} = \frac{1}{s} \qquad \text{(A-11)}$$

$$\overline{p}_{fwD} = \left(\overline{p}_{fD} - S \, \frac{\partial \overline{p}_{fD}}{\partial r_D}\right)_{r_D=1} \qquad \text{(A-12)}$$

Eq. A–8 can be expressed only in terms of p_{fD} using the relation of A–9;

$$\overline{p}_{mD} = \frac{\lambda \, \overline{p}_{fD}}{(1-\omega)s + \lambda} \qquad \text{(A-13)}$$

Subsituting A–13 in A–8 yields the following equation:

$$\frac{\partial^2 \overline{p}_{fD}}{\partial r_D^2} + \frac{1}{r_D} \frac{\partial \overline{p}_{fD}}{\partial r_D} - sf(s)\overline{p}_{fD} = 0 \qquad \text{(A-14)}$$

Let $r'_D = r_D\sqrt{sf(s)}$; then Eq. A–14 becomes:

$$r'^2_D \frac{\partial^2 \overline{p}_{fD}}{\partial r'^2_D} + r'_D \frac{\partial \overline{p}_{fD}}{\partial r'_D} - r'^2_D \, \overline{p}_{fD} = 0 \qquad \text{(A-15)}$$

Equation A–15 is a Bessel equation whose solution is:

$$\overline{p}_{fD} = AI_0\left(\sqrt{sf(s)} \, r_D\right) + BK_0\left(\sqrt{sf(s)} \, r_D\right) \qquad \text{(A-16)}$$

The values of the constants A and B in **Eq.** A–16 depend on the imposed outer boundary conditions given by Eqs. A–6 and A–7. Let **us** consider in "case 1" and "case 2" the development of the solution for the infinite system and the closed outer boundary case, respectively.

CASE 1: INFINITELY-LARGE RESERVOIR

Applying the Laplace transform to Eq. A-6 yields:

$$\mathrm{Rim}_{r_D \to \infty} \overline{p}_{fD} = 0 \qquad \text{(A-17)}$$

Because $\mathrm{Rim}_{r \to \infty} I_0(r) = \infty$ and $\mathrm{Rim}_{r \to \infty} K_0(r) = 0$, then A should be equal to zero. Then Eq. A-16 reduces to:

$$\overline{p}_{fD} = BK_0\left(\sqrt{sf(s)}\, r_D\right) \qquad \text{(A-18)}$$

To evaluate the constant B in Eq. A-18, Eqs. A-11 and A-12 are used. Both equations involve the dimensionless pressures at the wellbore and at the formation. Substituting A-18 in Eq. A-11 and A-12, and combining both equations, the constant B can be obtained:

$$B = \frac{1}{s\left[K_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)} + C_D s\left[K_0\left(\sqrt{sf(s)}\right) + SK_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)}\right]\right]} \qquad \text{(A-19)}$$

At the wellbore, the dimensionless wellbore pressure is given in Laplace space by:

$$\overline{p}_{fwD} = \frac{K_0\left(\sqrt{sf(s)}\right) + SK_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)}}{s\left[K_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)} + C_D s\left[K_0\left(\sqrt{sf(s)}\right) + SK_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)}\right]\right]} \qquad \textbf{(A-20)}$$

At the formation the dimensionless pressure p_{fD} is given by:

$$\overline{p}_{fD} = \frac{K_0\left(\sqrt{sf(s)}\right) r_D}{s\left[K_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)} + C_D s\left[K_0\left(\sqrt{sf(s)}\right) + SK_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)}\right]\right]} \qquad \text{(A-21)}$$

CASE 2: **CLOSED** OUTER **BOUNDARY**

Applying the Laplace transform to Eq. A–7 yields:

$$\left.\frac{\partial \bar{p}_{fD}}{\partial r_D}\right|_{r_D = r_{eD}} = 0 \qquad \text{(A–22)}$$

Differentiating A–16 with respect to r_D yields:

$$\frac{\partial \bar{p}_{fD}}{\partial r_D} = A I_1\left(\sqrt{sf(s)}\, r_D\right)\sqrt{sf(s)} - B K_1\left(\sqrt{sf(s)}\, r_D\right)\sqrt{sf(s)} \qquad \text{(A–23)}$$

$$\text{at} \quad r_D = r_{eD}\,, \quad \frac{\partial \bar{p}_{fD}}{\partial r_D} = 0$$

then:

$$A = \frac{B K_1\left(\sqrt{sf(s)}\, r_{eD}\right)}{I_1\left(\sqrt{sf(s)}\, r_{eD}\right)} \qquad \text{(A–24)}$$

Substituting the expression for A in Eq. A–16 yields:

$$\bar{p}_{fD} = B\, \frac{K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_0\left(\sqrt{sf(s)}\, r_D\right) + K_0\left(\sqrt{sf(s)}\, r_D\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)}{I_1\left(\sqrt{sf(s)}\, r_{eD}\right)}$$

(A–25)

The constant B can be evaluated using Eq. A–11 and Eq. A–12. The expression obtained for B is:

$$B = \frac{I_1\left(\sqrt{sf(s)}\, r_{eD}\right)}{C_D\, s^2\left[Y - S\sqrt{sf(s)}\, Z\right] - s\sqrt{sf(s)}\, X} \qquad \text{(A–26)}$$

where:

$$X = K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right) - K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)$$

$$Y = K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_0\left(\sqrt{sf(s)}\right) - K_0\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)$$

$$Z = K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right) - K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)$$

Then at the formation the dimensionless pressure is given by:

$$\overline{p}_{fD} = \frac{K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_0\left(\sqrt{sf(s)}\, r_D\right) + K_0\left(\sqrt{sf(s)}\, r_D\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)}{C_D s^2\left[Y - S\sqrt{sf(s)}\, Z\right] - s\sqrt{sf(s)}\, X} \tag{A-27}$$

and at the wellbore the dimensionless pressure is given by:

$$\overline{p}_{fwD} = \frac{K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_0\left(\sqrt{sf(s)}\right) + K_0\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)}{C_D s^2\left[Y - S\sqrt{sf(s)}\, Z\right] - s\sqrt{sf(s)}\, X - S\sqrt{sf(s)}\left[K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right) - K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)\right]} \tag{A-28}$$

A.2 SHORT AND LONG-TIME APPROXIMATIONS FOR THE DIMENTIONSLESS WELLBORE PRESSURE, p_{wfD}

A.2.1 SHORT TIME APPROXIMATION

The dimensionless wellbore pressure is given by **Eq.** A-20. For the case where $C_D = 0$, and skin = 0, Eq. A-20 reduces to:

$$\overline{p}_{fwD} = \frac{K_0\left(\sqrt{sf(s)}\right)}{s\sqrt{sf(s)}\, K_1\left(\sqrt{sf(s)}\right)} \tag{A-29}$$

A short-time approximation can be found by using asymptotic expansions for $K_0(Z)$ and $K_1(Z)$:

$$K_0(Z) = \sqrt{\frac{\pi}{2Z}}\; e^{-z} \qquad \text{(A-30)}$$

$$K_1(Z) = \sqrt{\frac{\pi}{2Z}}\; e^{-z} \qquad \text{(A-31)}$$

Substituting A-30 and A-31 in A-29 yields:

$$\bar{p}_{fwD} = \frac{1}{s\sqrt{sf(s)}} \qquad \text{(A-32)}$$

as $f(s) = \dfrac{\omega(1-\omega)s + \lambda}{(1-\omega)s + \lambda}$ for $s \to \infty$, $f(s) \to \omega$

Then :

$$\bar{p}_{fwD} \approx \frac{1}{s^{3/2}\sqrt{\omega}} \qquad \text{(A-33)}$$

Now,

$$\mathcal{L}^{-1}\; \frac{1}{s^{3/2}} = 2\sqrt{\frac{t_D}{\pi}}$$

Applying this to A-33 yields the following short-time approximation for p_{fwD} :

$$p_{fwD} = \frac{2}{\sqrt{\pi}} \left(\frac{t_D}{\omega} \right)^{1/2} \qquad \text{(A-34)}$$

A.2.2 LONG-TIME APPROXIMATIONS

In the case of $C_D = 0$, and skin effect = 0, Eq. A-20 reduces to Eq. A-29:

$$\overline{p}_{fwD} = \frac{K_0\left(\sqrt{sf(s)}\right)}{s\sqrt{sf(s)}\;K_1\left(\sqrt{sf(s)}\right)} \qquad \text{(A-29)}$$

A long-time approximation for A-29 can be obtained using the following relations for K_0 and K_1 valid for small values of the argument:

$$K_1(Z) = \frac{1}{Z} \qquad \text{(A-35)}$$

$$K_0(Z) = -\left(\gamma + n\,\frac{Z}{2}\right) \qquad \text{(A-36)}$$

Substituting A-35 and A-36 in A-29 yields:

$$\overline{p}_{fwD} = -\frac{1}{2}\left[\frac{\ell n\ s}{s} - \frac{2}{s}\left(\ell n\ 2 - \gamma\right)\right] \qquad \text{(A-37)}$$

Now,

$$\mathcal{L}^{-1}\left\{\frac{\ell n\ s}{s}\right\} = -\gamma - \ell n\ t_D$$

Using this in Eq. 3-37 yields the following relation for p_{fwD} valid for long times:

$$\overline{p}_{fwD} = \frac{1}{2}\left(\ell n\ t_D + 0.80909\right) \qquad \text{(A-38)}$$

A.3 SHORT AND LONG-TIME APPROXIMATIONS FOR THE DIMENSIONLESS FORMATION FRACTURE AND MATRIX PRESSURES

A.3.1 SHORT-TIME APPROXIMATION

The dimensionless formation fracture pressure is given by Eq. A-21, In the case where $C_D = 0$, Eq. A-21 reduces to:

$$\overline{p}_{fwD} = \frac{K_0\left(\sqrt{sf(s)}\, r_D\right)}{s\, K_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)}} \qquad \text{(A-39)}$$

The dimensionless formation matrix pressure can be obtained using Eq. A-13 and Eq. A-39:

$$\overline{p}_{mD} = \frac{\lambda}{(1-\omega)s + \lambda}\; \frac{K_0\left(\sqrt{sf(s)}\, r_D\right)}{s\, K_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)}} \qquad \text{(A-40)}$$

Substituting A-30 and A.31 in A-39 yields the following expression for $\overline{p}_{fD}$:

$$\overline{p}_{fD} = \frac{1}{\sqrt{\omega}\, r_D}\; \frac{1}{s^{3/2}}\; e^{-(r_D-1)\sqrt{\omega}\sqrt{s}} \qquad \text{(A-41)}$$

Now:

$$\mathcal{L}^{-1}\left\{\frac{e^{-k\sqrt{s}}}{s^{1+n/2}}\right\} = (4t)^{\frac{n}{2}}\left[i^n \operatorname{erfc}\left(\frac{k}{2\sqrt{t}}\right)\right]$$

$$\text{for } n = 0, 1, 2, \ldots ; k \geq 0 \qquad \text{(A-42)}$$

Using this in Eq. A-41 yields the following short-time approximation for p_{fD}:

$$p_{fD} = 2\left(\frac{t_D}{\omega r_D}\right)^{1/2}\left[i\ \mathrm{erfc}\left(\frac{r_D - 1}{2\sqrt{t_D/\omega}}\right)\right] \tag{A-43}$$

In a similar manner, as $s \to \infty$, the dimensionless matrix pressure as given by Eq. A-40 reduces to:

$$\bar{p}_{mD} = \frac{\lambda}{(1-\omega)\sqrt{\omega r_D}}\ \frac{1}{s^{5/2}}\ e^{-(r_D-1)\sqrt{\omega}\sqrt{s}} \tag{A-44}$$

Using relation A-42 in Eq. A-44 yields the following expression for p_{mD} valid at short times:

$$p_{mD} = \frac{\lambda\omega r_D}{(1-\omega)}\left(\frac{4t_D}{\omega r_D}\right)^{3/2}\left[i^3\ \mathrm{erfc}\left(\frac{r_D - 1}{2\sqrt{t_D/\omega}}\right)\right] \tag{A-45}$$

A.3.2 LONG-TIME APPROXIMATION

The dimensionless formation fracture pressure in the case where $C_D = 0$ is given by Eq. A-39:

$$\bar{p}_{fD} = \frac{K_0\left(\sqrt{sf(s)}\ r_D\right)}{s\sqrt{sf(s)}\ K_1\left(\sqrt{sf(s)}\right)} \tag{A-39}$$

A long-time approximation can be obtained substituting Eqs. A-35 and A-36 in Eq. A-39:

$$p_{fD} = -\frac{1}{2}\left[2\gamma + \frac{\ln s}{s} + 2\ln r_D - 2\ln 2\right] \qquad (A-46)$$

Now,

$$\mathcal{L}^{-1}\left\{\frac{\ln s}{s}\right\} = -\gamma - \ln t_D$$

Using this in *A-46* yields the following expression for p_{fD} valid at long times:

$$p_{fD} = \frac{1}{2}\left[\ln t_D/r_D^2 + 0.8091\right] \qquad (A-47)$$

which is the well-known line-source solution for homogeneous systems. In a similar manner, when $s \to 0$, the dimensionless matrix pressure as given by Eq. *A-40* reduces to:

$$\overline{p}_{mD} = \overline{p}_{fD} \qquad (A-48)$$

Then at long times the dimensionless matrix pressure becomes equal to the fracture pressure, and is given by Eq. *A-47*.

APPENDIX B

DERIVATION OF SOLUTION FOR THE CONSTANT INNER PRESSURE CASE

This appendix contains a derivation of the solution for the constant inner pressure case, derivation of the solution for the dimensionless fracture and matrix pressures, and the limiting forms of the solutions.

B.1 DERIVATION OF THE SOLUTION FOR THE CONSTANT PRESSURE CASE

The derivation of the solution for the constant flowrate case was presented in Appendix A. In a similar manner the solutions for the constant pressure case can be derived. The dimensionless wellbore flowrate into the wellbore is given by:

$$q_D(t_D) = -\left(\frac{\partial p_D}{\partial r_D}\right)_{r_D=1} \tag{B-1}$$

That is, once the dimensionless wellbore pressure is given, the dimensionless flowrate is equal to the derivative as given by Eq. B-1.

As a matter of fact, a simple relationship exists between the Laplace transformed solutions for the constant pressure and constant rate problems, as was indicated by van Everdingen and Hurst (1949). This relation is given by:

$$s\ \overline{p}_{fwD}(s)\ \overline{Q}_D(s) = \frac{1}{s^2} \tag{B-2}$$

The cumulative production is related to the flowrate by:

$$\bar{Q}_D(s) = \frac{\bar{q}_D(s)}{s} \qquad \text{(B-3)}$$

Substituting Eq. B-3 in Eq. B-2 yields the following relationship between $\bar{q}_D$ and $\bar{p}_{wD}$:

$$\bar{q}_D(s) = \frac{1}{s^2 \bar{p}_{fwD}(s)} \qquad \text{(B-4)}$$

Eq. B-4 can be used together with the solutions presented in Appendix A for $\bar{p}_{fwD}$ to obtain the Laplace transformed solutions for the dimensionless flowrate q_D . We consider in "case 1" and "case 2" the application of Eq. *B-4* to obtain the solutions for an infinite reservoir and the closed outer boundary case, respectively.

CASE 1: INFINITELY LARGE RESERVOIR

The dimensionless wellbore pressure in the case where $C_D = 0$ *is* given by Eq. A-20:

$$\bar{p}_{fwD} = \frac{K_0\left(\sqrt{sf(s)}\right) + S\, K_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)}}{s\, K_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)}} \qquad \text{(A-20)}$$

Substituting Eq. A-20 in Eq. B-4 yields:

$$\bar{q}_D = \frac{\sqrt{sf(s)}\, K_1\left(\sqrt{sf(s)}\right)}{s\left[K_0\left(\sqrt{sf(s)}\right) + S\, K_1\left(\sqrt{sf(s)}\right)\sqrt{sf(s)}\right]} \qquad \text{(B-5)}$$

CASE 2: CLOSED OUTER BOUNDARY

The dimensionless wellbore pressure in the case where $C_D = 0$ is given by Eq. A-28:

$$\bar{p}_{fwD} = \frac{K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_0\left(\sqrt{sf(s)}\right) + K_0\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)}{s\sqrt{sf(s)}\left[K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right) - K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right)\right] - S\sqrt{sf(s)}\left[K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right) - K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)\right]} \qquad \text{(A-28)}$$

Substituting A-28 in Eq. B-4 yields the following expression for the dimensionless wellbore flowrate:

$$\bar{q}_D = \frac{\sqrt{sf(s)}\left[K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right) - K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right)\right]}{s\left\{\left[K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_0\left(\sqrt{sf(s)}\right) + K_0\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)\right] - S\sqrt{sf(s)}\left[K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right) - K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)\right]\right\}} \qquad \text{(B-6)}$$

B.2 DERIVATION OF SOLUTION FOR THE DIMENSIONLESS FRACTURE AND MATRIX PRESSURES

The derivation of the solutions for this case is similar to the one presented in Appendix A. However, for the case of constant inner pressure the dimensionless pressure is defined as:

$$p_{fD} = \frac{p_i - p_f}{p_i - p_{fw}} \qquad \text{(B-7)}$$

Then Eq. A-5 representing the skin effect condition is:

$$1 = \left(p_{fD} - S \frac{\partial p_{fD}}{\partial r_D} \right)_{r_D=1} \tag{B-8}$$

Applying the Laplace transformation to Eq. B-8 yields:

$$\frac{1}{s} = \left[\overline{p}_{fD} - S \frac{\partial \overline{p}_{fD}}{\partial r_D} \right]_{r_D=1} \tag{B-9}$$

The solution of Eqs. A-1 and A-2 for a infinitely large reservoir is given by Eq. A-18:

$$\overline{p}_{fD} = B\, K_0 \left(\sqrt{sf(s)}\, r_D \right) \tag{A-18}$$

Substituting Eq. A-18 in Eq. B-9 yields the value for the constant B in Eq. A-18:

$$B = s \left[K_0 \left(\sqrt{sf(s)} \right) + S\sqrt{sf(s)}\, K_1 \left(\sqrt{sf(s)} \right) \right]^{-1} \tag{B-10}$$

Then the dimensionless fracture pressure in Laplace space is given by:

$$\overline{p}_{fD}(r_D,s) = \frac{K_0 \sqrt{sf(s)}\, r_D}{s \left[K_0 \left(\sqrt{sf(s)} \right) + S\sqrt{sf(s)}\, K_1 \left(\sqrt{sf(s)} \right) \right]} \tag{B-11}$$

The dimensionless matrix pressure can be obtained using relation A-13 and Eq. B-11:

$$\overline{p}_{mD}(r_D,s) = \frac{\lambda \ K_0 \left(\sqrt{sf(s)}\, r_D \right)}{\left[s(1-\omega) + \lambda \right] s \left[K_0 \left(\sqrt{sf(s)} \right) + S\sqrt{sf(s)}\, K_1 \left(\sqrt{sf(s)} \right) \right]} \tag{B-12}$$

B.3 LIMITING FORMS OF THE SOLUTIONS

B.3.1 INFINITELY LARGE RESERVOIR

The dimensionless flowrate at the wellbore for a zero skin factor is given by Eq. B-5:

$$\bar{q}_D = \frac{\sqrt{sf(s)}\, K_1\left(\sqrt{sf(s)}\right)}{s\, K_0\left(\sqrt{sf(s)}\right)} \tag{B-5}$$

A short-time approximation can be obtained substituting the asymptotic expansions for $K_0(z)$ and $K_1(z)$ given by Eqs. A-30 and A-31 in Eq. B-5. This yields:

$$\bar{q}_D \simeq \frac{\sqrt{sf(s)}}{s} \tag{B-13}$$

as $s \to \infty$, $f(s) \to \omega$

then:

$$\bar{q}_D = \frac{\sqrt{s\omega}}{s} \tag{B-14}$$

now

$$\mathcal{L}^{-1}\left\{\frac{\sqrt{s}}{s}\right\} = \frac{1}{\sqrt{\pi t}} \tag{B-15}$$

Applying relation B-15 to Eq. B-14 yields the following short-time approximation for q_D :

$$q_D = \frac{\sqrt{\pi}}{\pi}\left(\frac{t_D}{\omega}\right)^{-1/2} \tag{B-16}$$

A long time approximationto Eq. B–5 may be obtained using Eqs. A–35 and A–36 in Eq. B–5.

Another way to obtain a long–time approximation uses the relation presented by Jacob and Lohman (1952) for q_D and p_D : $q_D = 1/p_D$ which is valid for $t_D \geq 8.10^4$ with 1%. A long–time approximation for p_{fwD} is given by Eq. A–38. Then:

$$q_D = \frac{2}{\ln t_D + 0.80909} \qquad \text{(B–17)}$$

B.3.2 <u>CLOSED **OUTER** BOUNDARY</u>

The dimensionless flowrate at the wellbore is given by Eq. B–6. For a zero skin factor, is reduces to:

$$\bar{q}_D = \frac{\sqrt{sf(s)}\left[K_1\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right) - K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_1\left(\sqrt{sf(s)}\right)\right]}{s\left[K_1\left(\sqrt{sf(s)}\, r_{eD}\right) I_0\left(\sqrt{sf(s)}\right) + K_0\left(\sqrt{sf(s)}\right) I_1\left(\sqrt{sf(s)}\, r_{eD}\right)\right]} \qquad \text{(B-6)}$$

A short time approximation for Eq. B-6 will yield the same expression as that for the infinite reservoir case as given by Eq. B–16:

$$q_D(t_D) = \frac{\sqrt{\pi}}{\pi}\left(\frac{t_D}{\omega}\right)^{-1/2} \qquad \text{(B–16)}$$

Along–time approximation to Eq. B-6 can be obtained using Eq. A–35 and A–36 for $K_1(Z)$ and $K_0(Z)$ and the following relations for $I_0(Z)$ and $I_1(Z)$:

$$I_0(Z) = 1 + \frac{1}{4} Z^2 \qquad \text{(B-18)}$$

$$I_1(Z) = \frac{1}{2} Z + \frac{1}{8} Z^3 \qquad \text{(B-19)}$$

Substituting these expressions in Eq. B-6 yields the following limiting expression for the dimensionless flowrate $\overline{q}_D$:

$$\lim_{s \to 0} \overline{q}_D(s) = \frac{r_{eD}^2 - 1}{2} \left\{ \frac{\omega(1-\omega)s + \lambda}{(1-\omega)s + \lambda} \right\} \qquad \text{(B-20)}$$

The cumulative production, Q_D , is related to the transient rate by Eq. B-3:

$$\overline{Q}_D(s) = \frac{\overline{q}_D(s)}{s} \qquad \text{(B-3)}$$

Eq. B-3 can be used' to express Eq. B-20 in terms of the cumulative production, Q_D :

$$\lim_{s \to 0} \overline{Q}_D(s) = \frac{r_{eD}^2 - 1}{2} \; \frac{1}{s} \left\{ \frac{\omega(1-\omega)s + \lambda}{(1-\omega)s + \lambda} \right\} \qquad \text{(B-21)}$$

Now,

$$\mathcal{L}^{-1} \left\{ \frac{1}{(s+a)(s+b)} \right\} = \frac{e^{-at} - e^{-bt}}{b - a} \qquad \text{(B-22)}$$

Applying this to Eq. B-21 yields the following long-time approximations for Q_D and q_D :

$$Q_D(t_D) = \frac{r_{eD}^2 - 1}{2} \left[1 + (\omega-1)\, e^{-\frac{\lambda t_D}{\omega-1}} \right] \qquad \text{(B-23)}$$

$$q_D(t_D) = \frac{eD}{2} \lambda \; e^{\frac{\lambda t}{\omega - 1}} \qquad (B\text{-}24)$$

Equation B-23 is appropriate for dimensionless times, $t_D \geq 100$. This condition is proper for all values of ω and A . However, for small values of ω and λ , the following relations are also valid:

$$\text{If } \lambda << 1 \text{, then } t_D > 100\, \omega r_{eD}^2$$

and

$$\text{If } \omega << 1 \text{, then } t_D > 100\, r_{eD}^2 - \frac{1}{\lambda}$$

B.3.3 DIMENSIONLESS MATRIX AND FRACTURE PRESSURES

The dimensionless fracture pressure is given by Eq. B-11. In the case where the skin factor is zero, Eq. B-11 reduces to:

$$\bar{p}_{fD}(r_D, s) = \frac{K_0\left(\sqrt{sf(s)}\, r_D\right)}{s\, K_0\left(\sqrt{sf(s)}\right)} \qquad (B\text{-}11)$$

A short-time approximation to Eq. B-11 is obtained by substituting K_0 by Eq. A-30. This yields:

$$\lim_{s \to} \bar{p}_{fD} = \sqrt{\frac{1}{r_D}}\; \frac{1}{s}\; e^{-\sqrt{\omega}(r_D - 1)\sqrt{s}} \qquad (B\text{-}25)$$

Applying relation A-42 to Eq. B-25 yields the following short-time approximation for the dimensionless fracture pressure:

$$p_{fD} \doteq \sqrt{\frac{1}{r_D}}\ \mathrm{erfc}\left(\frac{r_D - 1}{2\sqrt{t_D/\omega}}\right) \qquad \text{(B-26)}$$

In a similar manner for $s \to \infty$ the dimensionless matrix pressure as given by Eq. B-12 reduces to:

$$\lim_{s\to\infty} \bar{p}_{mD} = \frac{\lambda\sqrt{r_D}}{r_D}\ \frac{1}{s^2}\ e^{-\sqrt{\omega}(r_D-1)\sqrt{s}} \qquad \text{(B-27)}$$

Applying relation A-42 to Eq. B-27 yields the following short-time approximation for the dimensionless matrix pressure:

$$\lim_{t_D\to 0} p_{mD} = \frac{4\lambda\omega\sqrt{r_D}}{r_D}\left(\frac{t_D}{\omega}\right)\left[i^2\ \mathrm{erfc}\left(\frac{r_D - 1}{\sqrt{t_D/\omega}}\right)\right] \qquad \text{(B-28)}$$

APPENDIX C

TABULATED AND GRAPHICAL SOLUTIONS

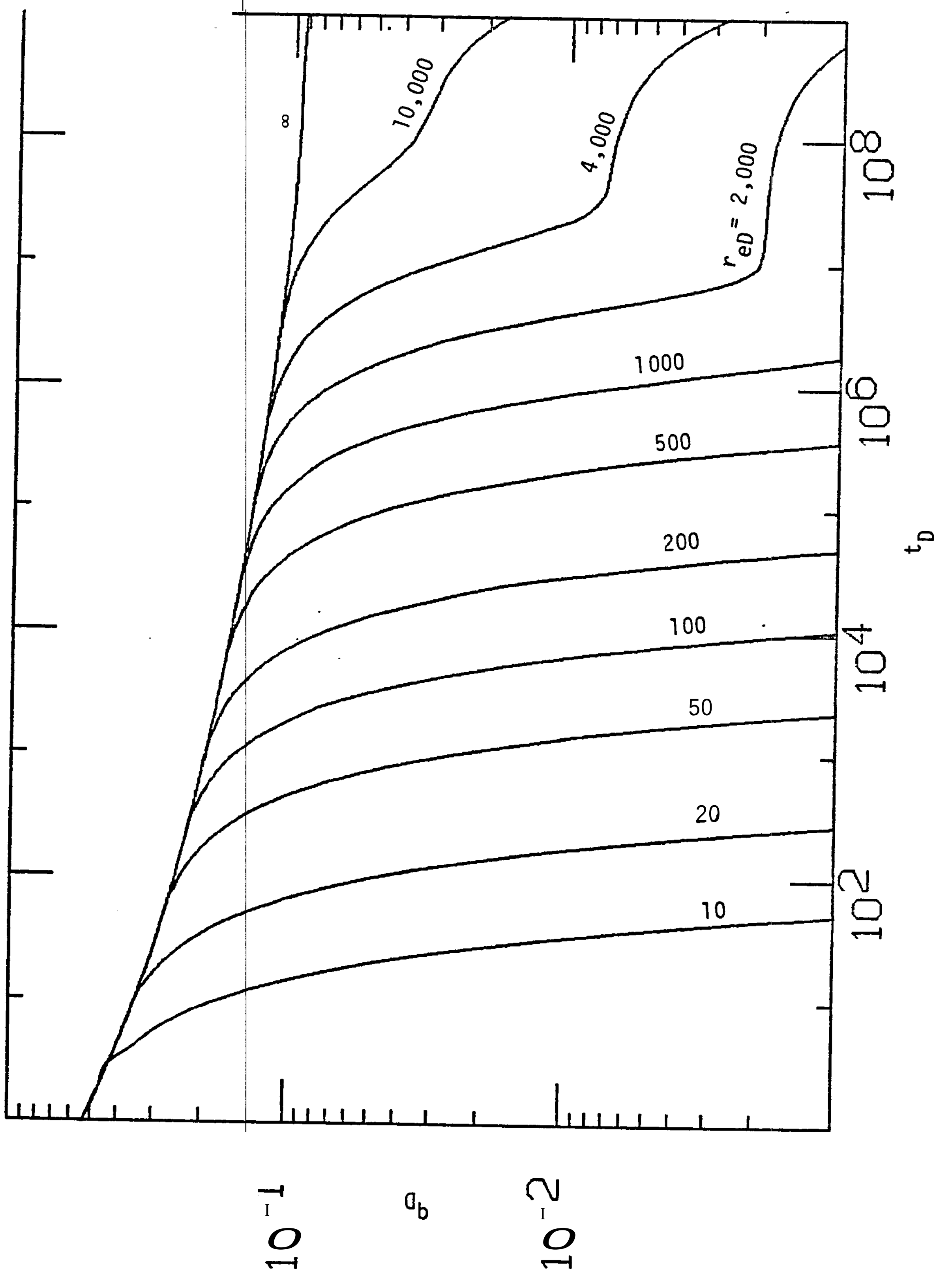
This section contains type curves of q_D vs t_D for different values of ω and λ for both infinite and closed outer boundary cases; tabulated values of q_D vs t_D for both infinite and closed outer boundary cases; and tabulated values of p_{fD} vs $t_D/r_D{}^2$, and p_{mD} vs $t_D/r_D{}^2$ for different values of λ, ω, and θ.

C.1 TYPE CURVES

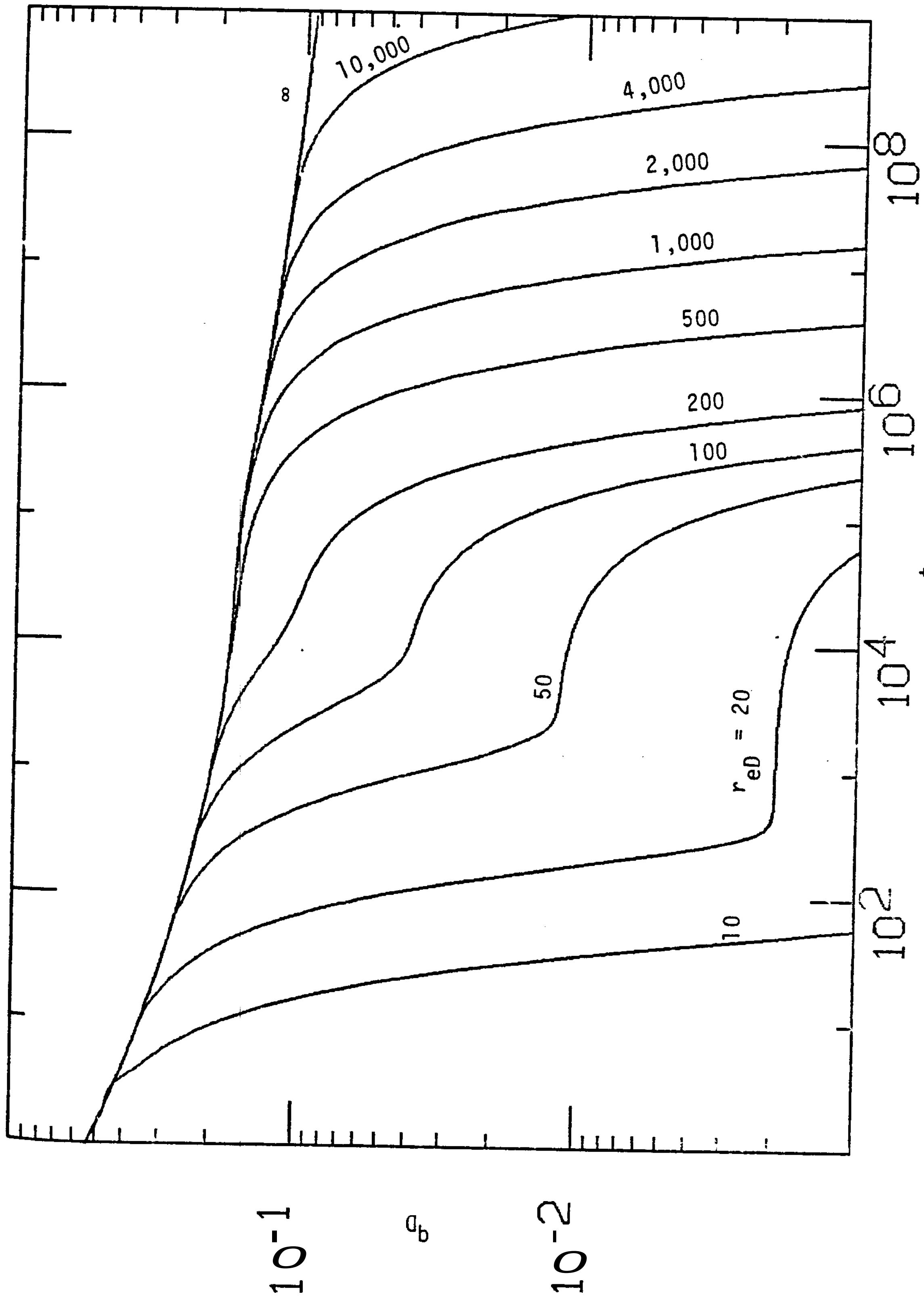
A graph of q_D vs t_D has been made for each of the following values of ω and A :

ω	λ
0.001	
0.001	10^{-6}
0.001	10^{-7}
0.001	10^{-4}
0.01	10^{-9}
0.01	10^{-6}
0.01	10^{-7}
0.01	10^{-5}
0.01	10^{-4}
0.1	10^{-6}
0.1	10^{-7}
0.1	10^{-4}
0.1	10^{-5}
0.1	10^{-9}

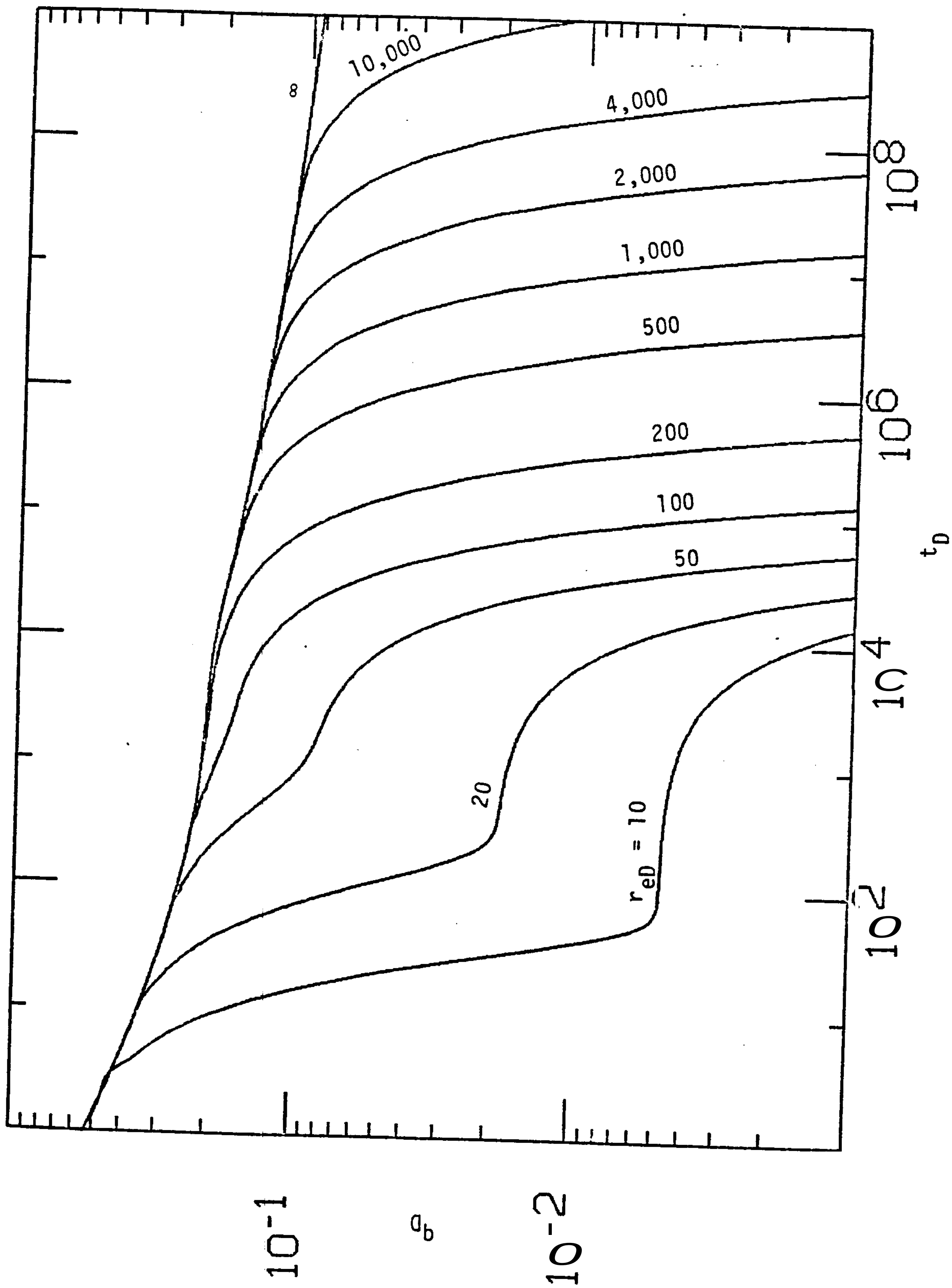
The solution presented are for a well producing at a constant inner pressure from both a closed and an infinite outer boundary naturally-fractured reservoir. Several values of r_{eD} are considered.



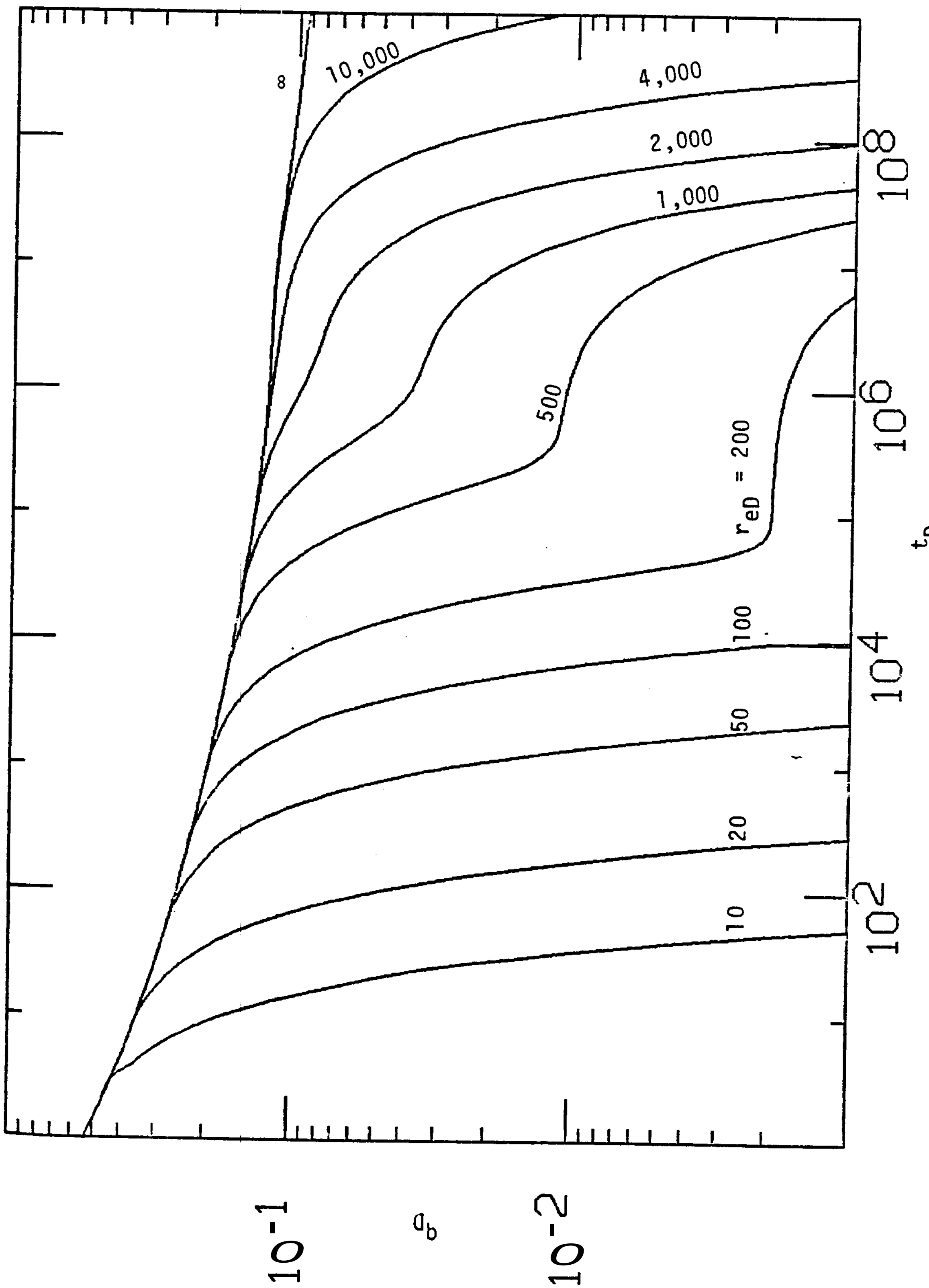
C-1 $\omega = 0.1, \lambda = 10^{-9}$



C-2: $\omega = 0.1$, $\lambda = 10^{-5}$

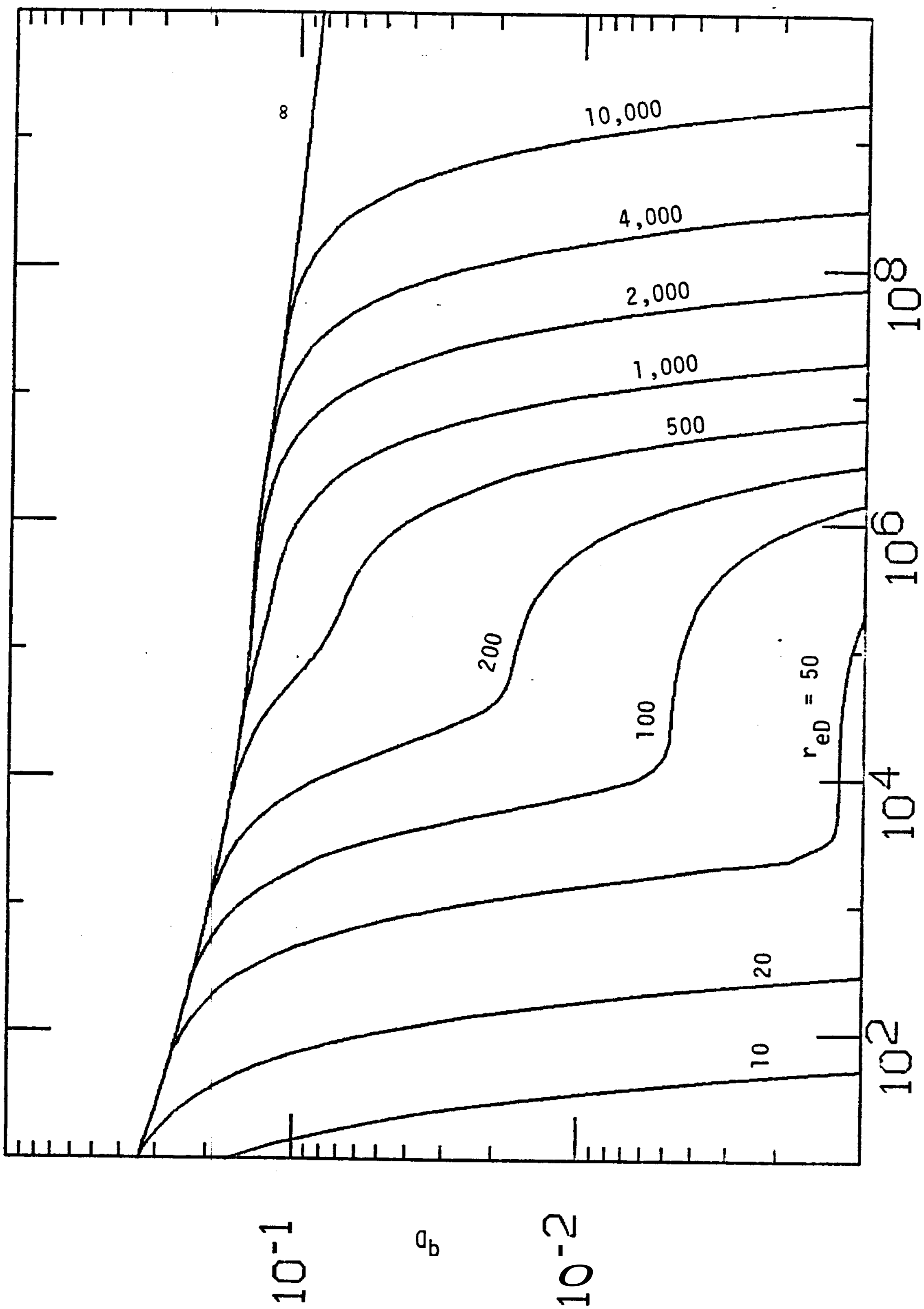


C-3: $\omega = 0.1$, $\lambda = 10^{-4}$

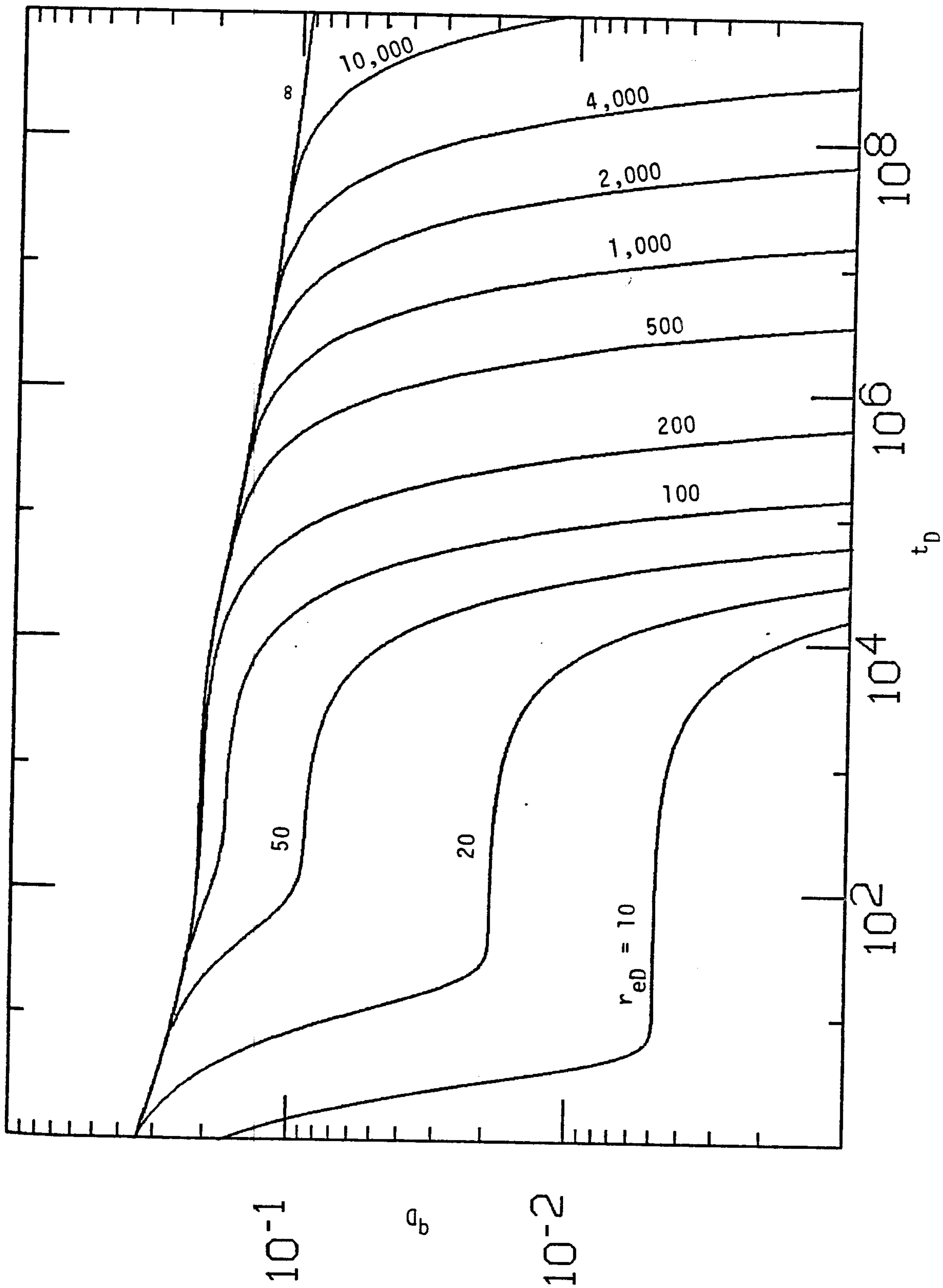


10^{-1}
10^{-2}
q_b
10^2
10^4
10^6
10^8
t_D
r_{eD} = 200
10
20
50
100
500
1,000
2,000
4,000
10,000
8

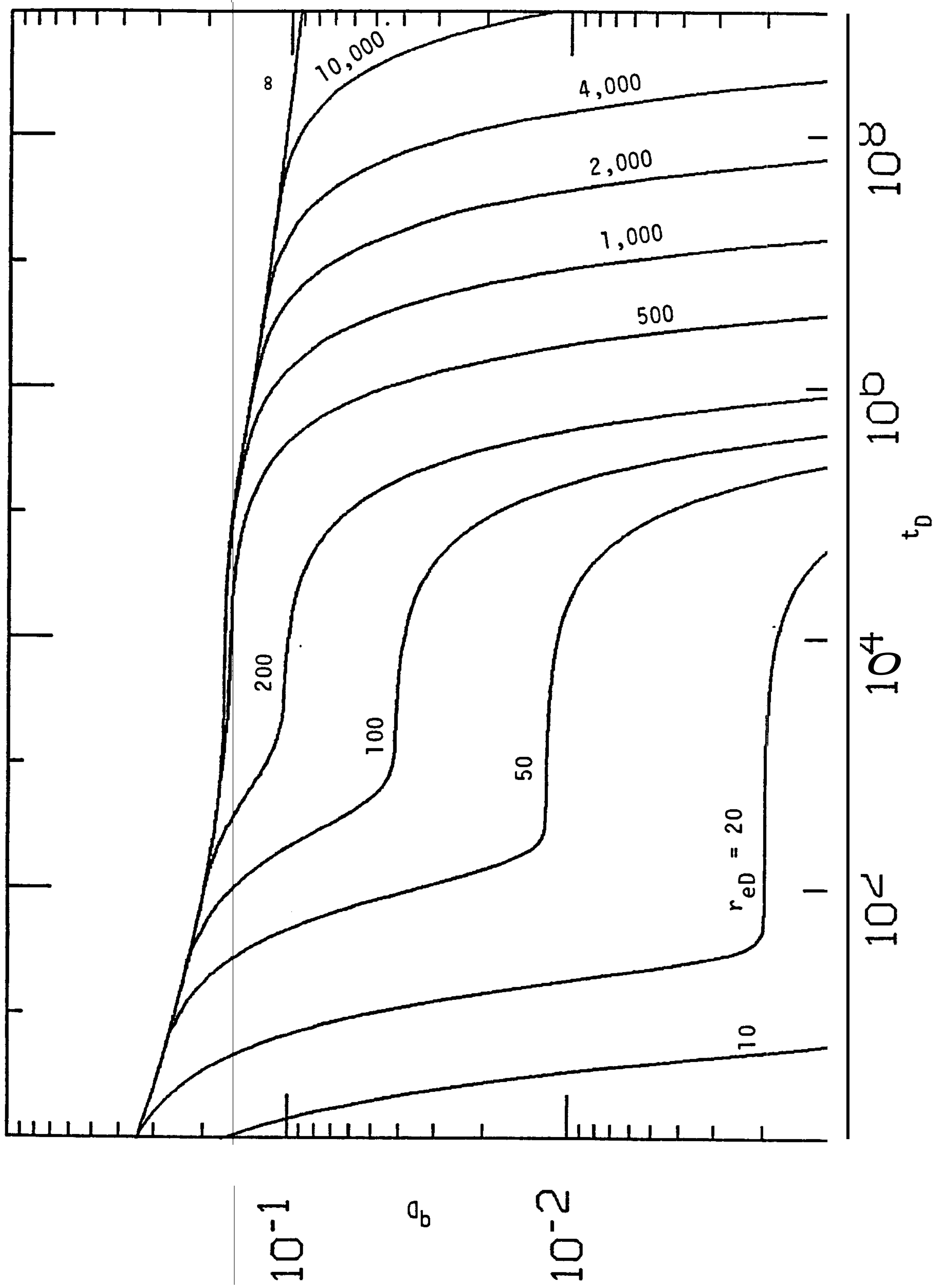
C-φ: ω = 0.1, λ = 10^{-7}



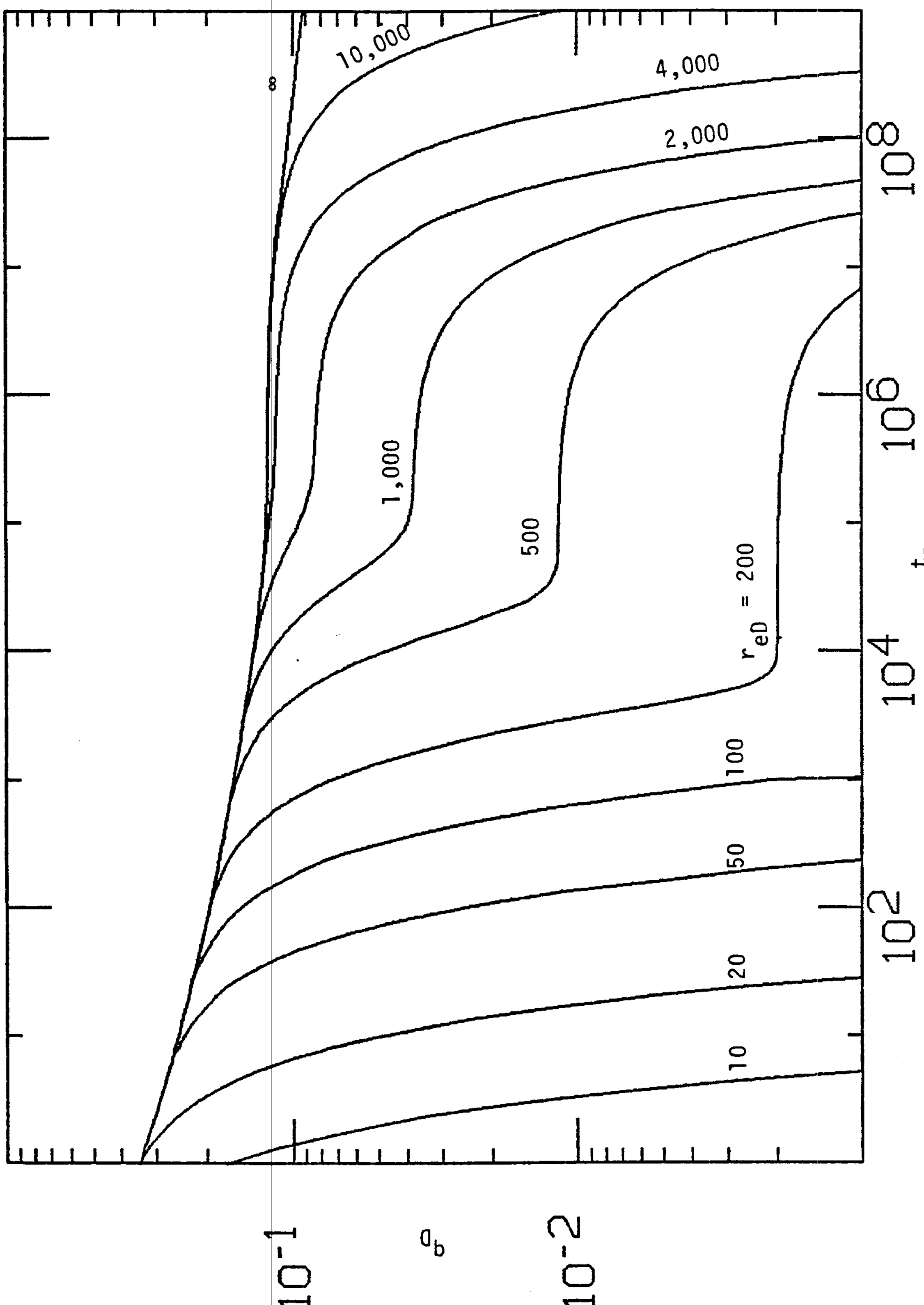
C-5: $\omega = 0.1$, $\lambda = 10^{-6}$



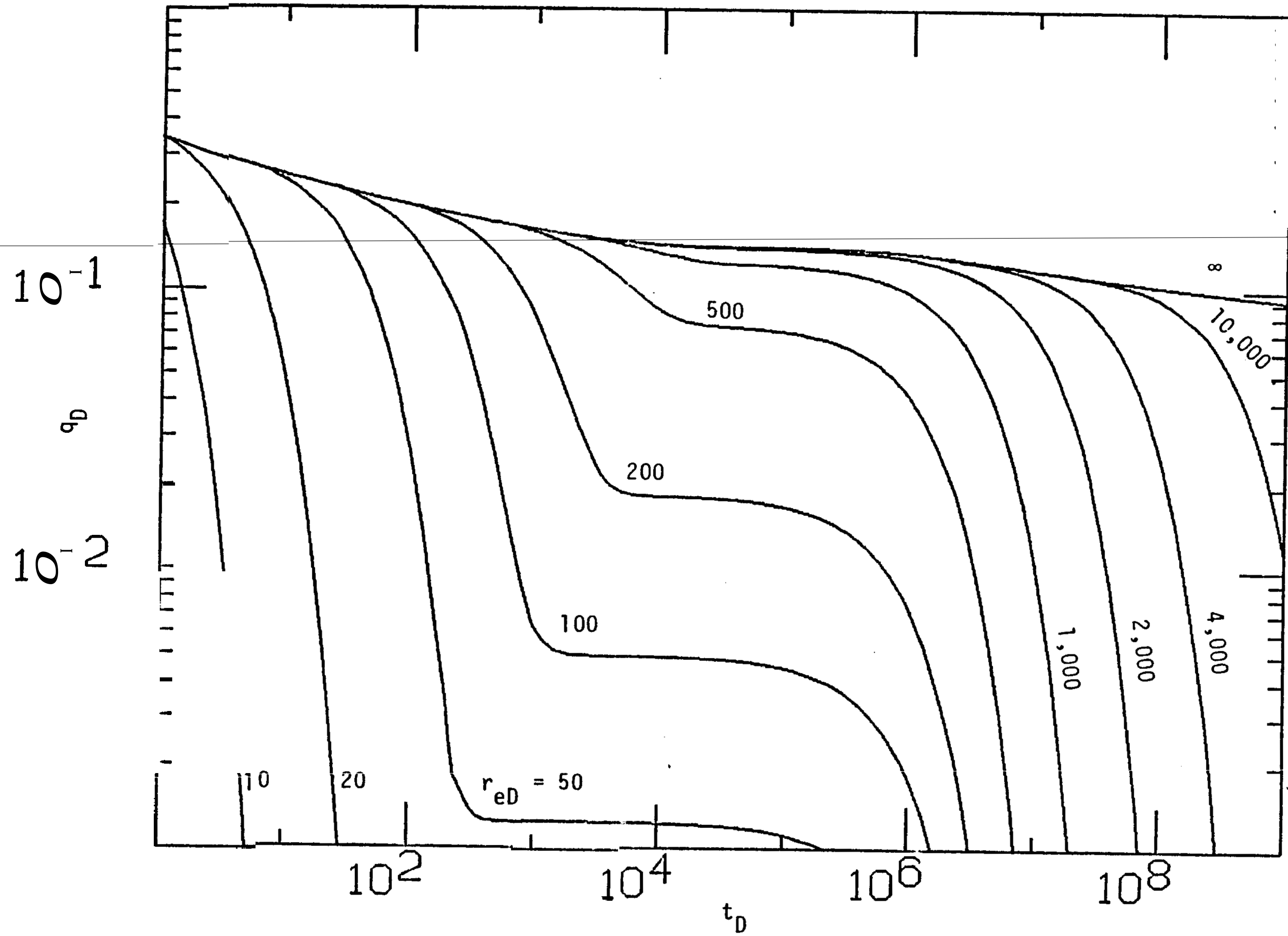
C-6: $\omega = 0.01$, $\lambda = 10^{-4}$



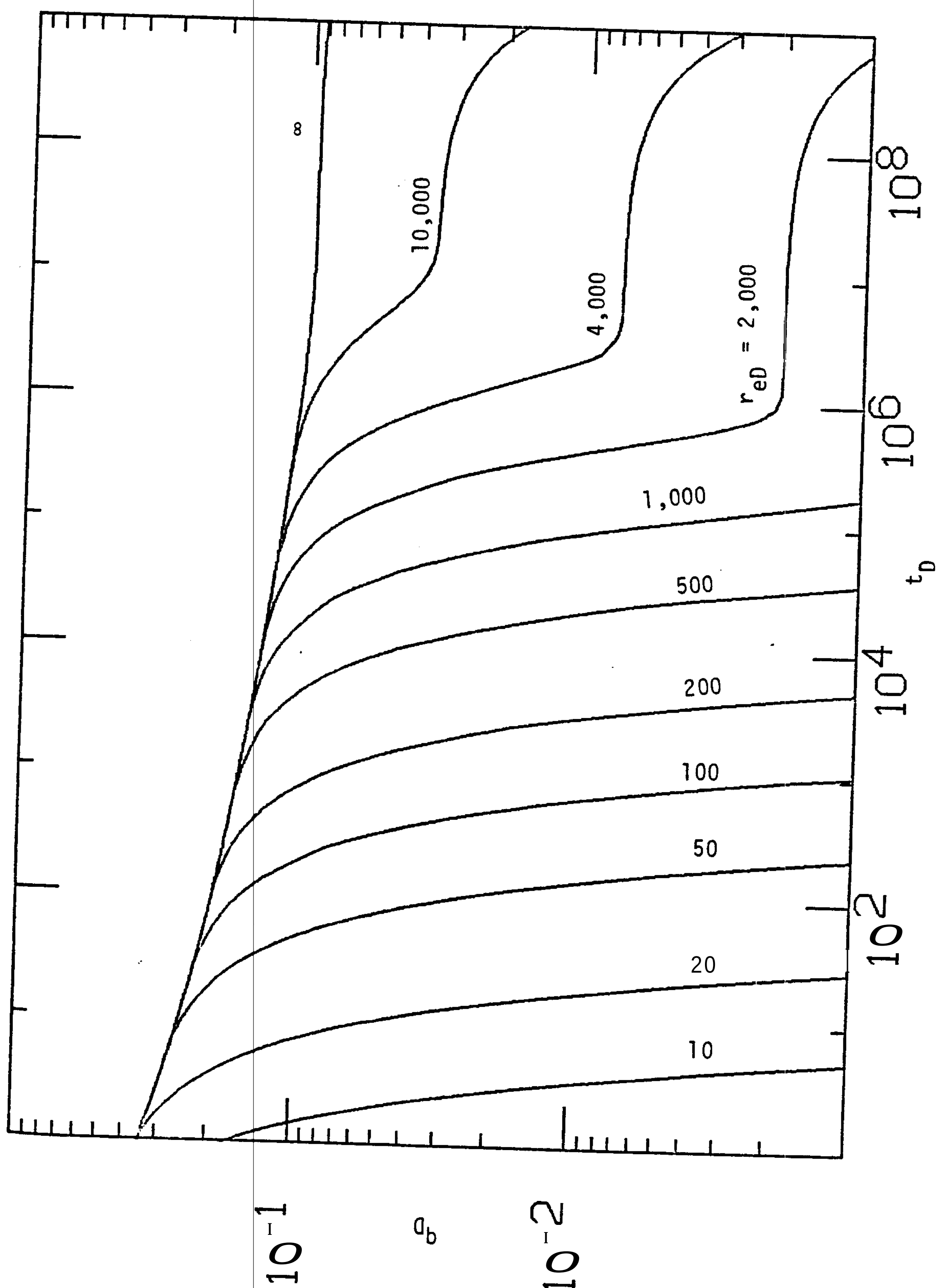
C-7: ω = 0 01, λ = 10^{-5}



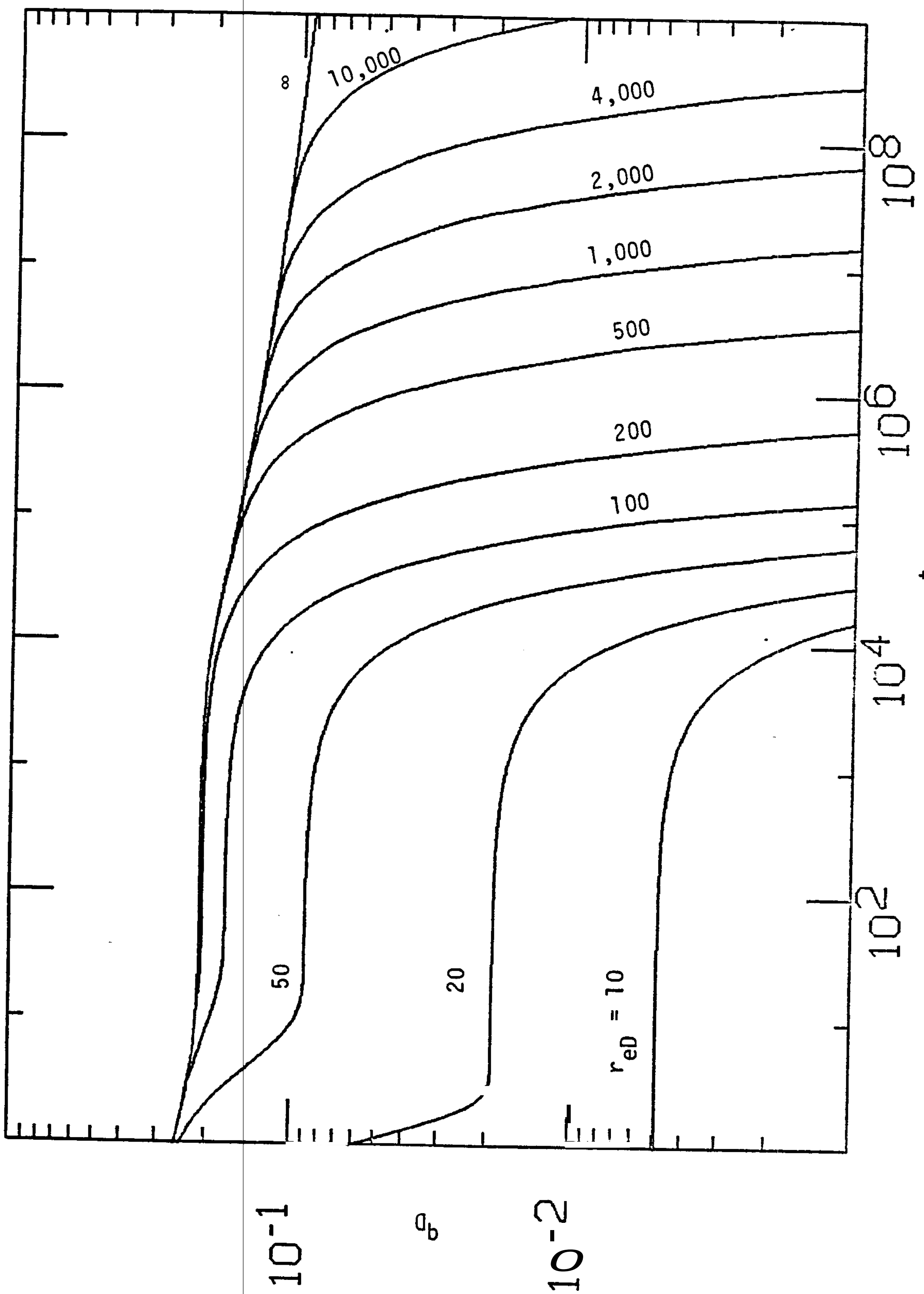
C-8: $\omega = 0.01$, $\lambda = 10^{-7}$



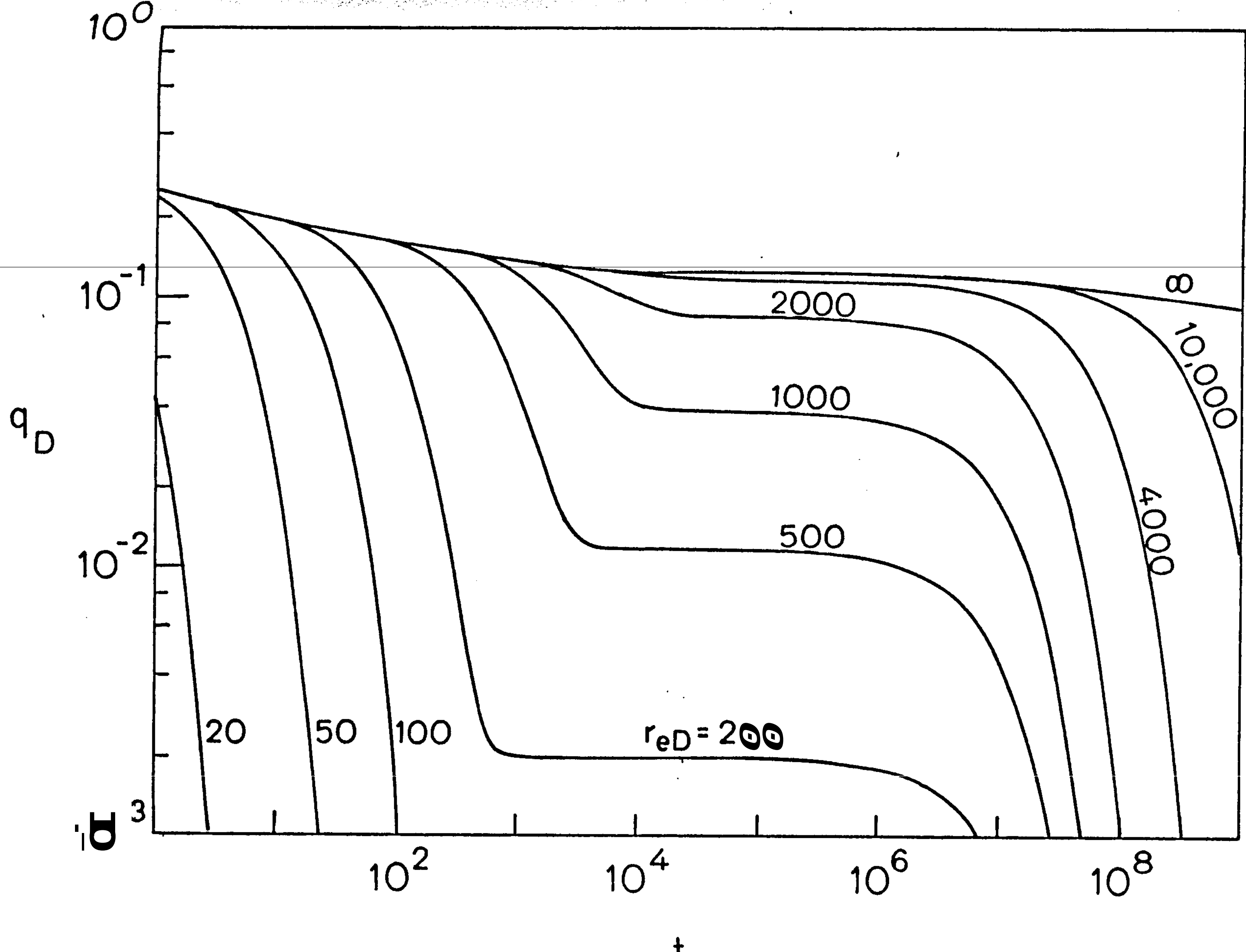
C-9: $\omega = 0.01 \quad \lambda = 10^{-6}$



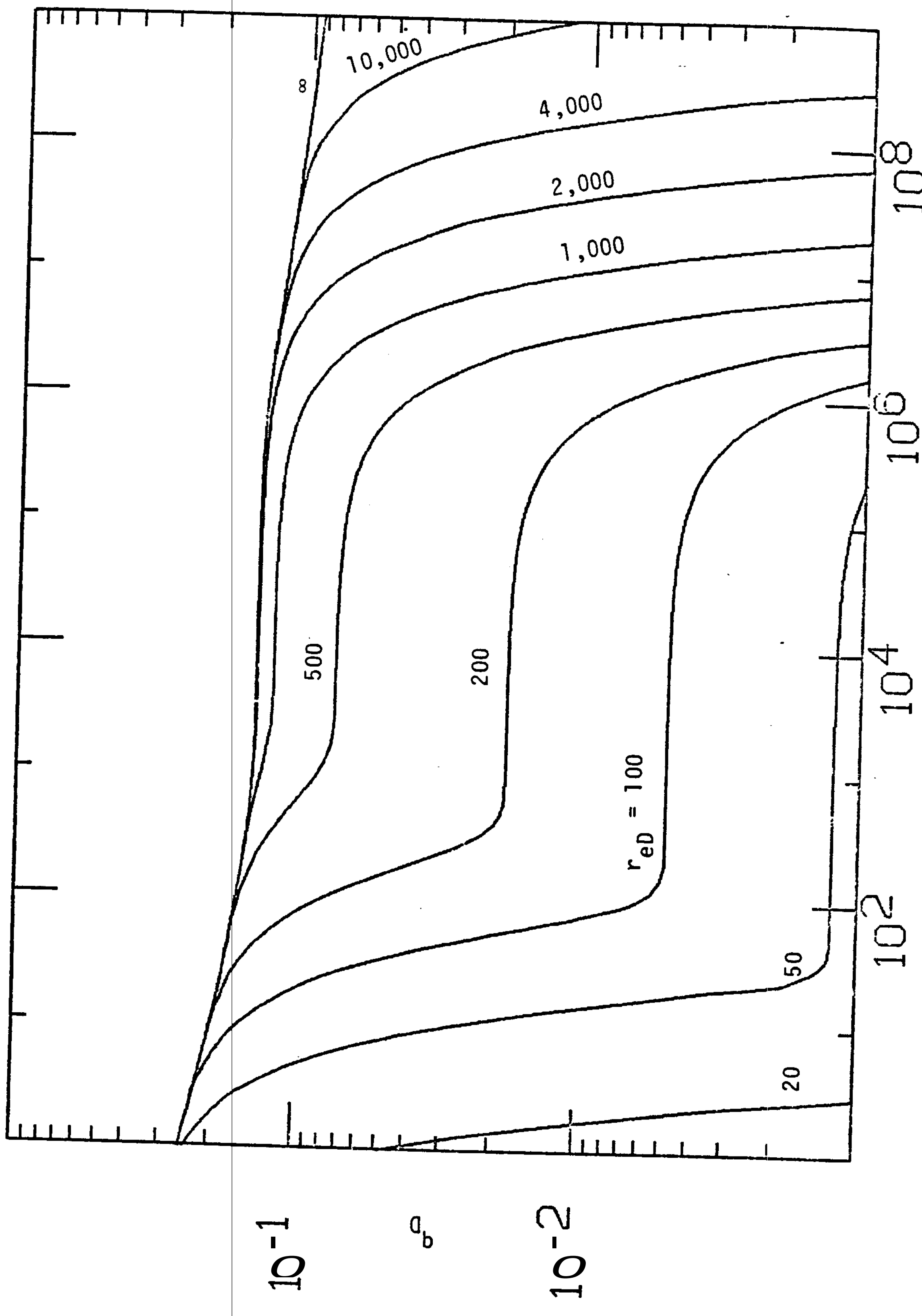
C-10: $\omega = 0\ 6$, $\lambda = 10^{-9}$



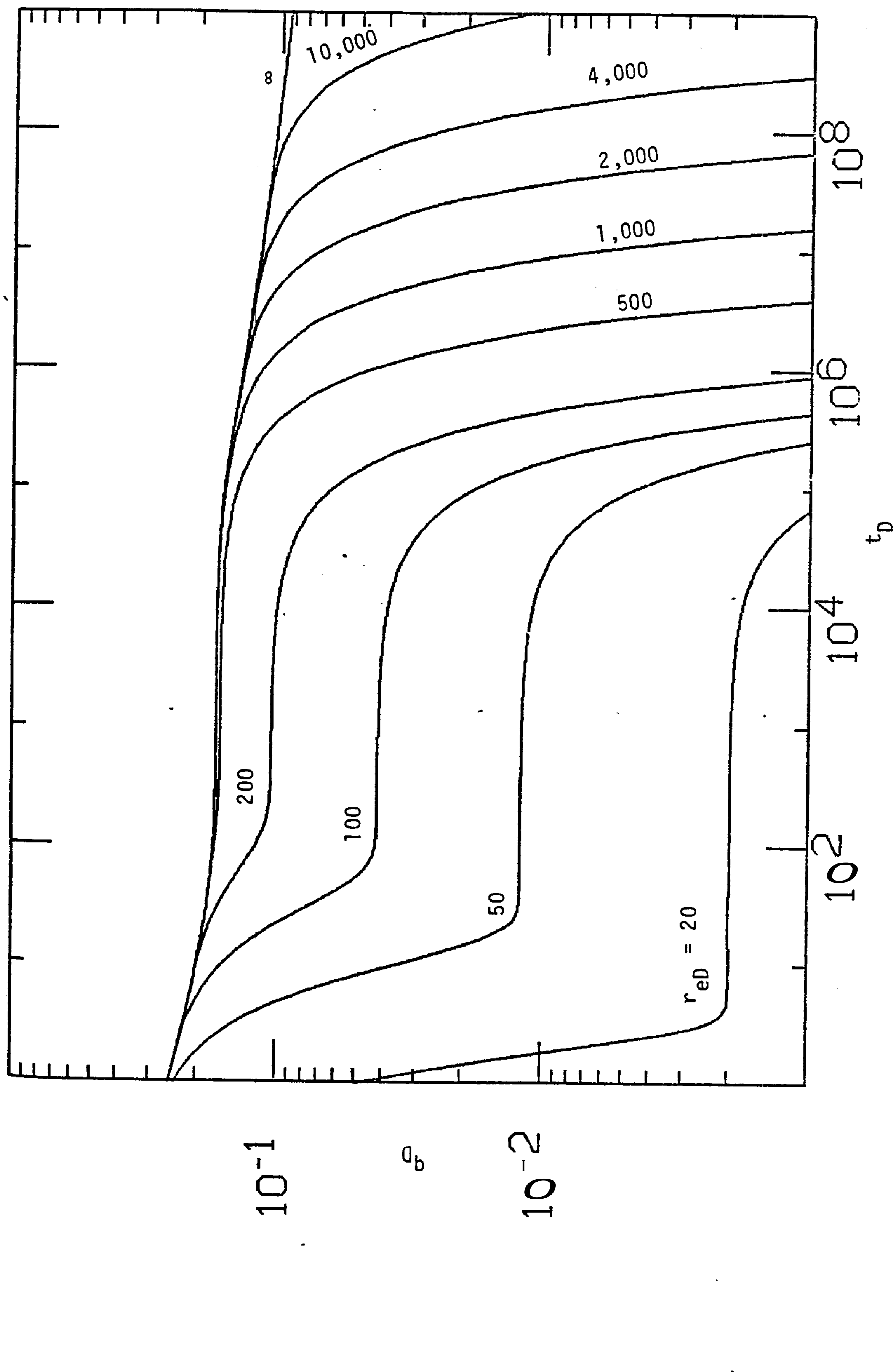
C-11: $\omega = 0.001, \lambda = 10^{-4}$



C-12: $\omega = 0.001$, $\lambda = 10^{-7}$



C-13: $\omega = 0\ 06$, $\lambda = 10^{-6}$



C-14: $\omega = 0.001$, $\lambda = 10^{-5}$

C.2 TABULATI VALUES .

Solutior for the dimensionless flowrate, q_D , as a function of dimensionless time, t_D , for a well producing at constant inner pressure from both a c osed and an infinite outer boundary, naturally-fractured reservoir are tabulated for different values of the dimensionless wellbore outer radius, r_{eD} , and the following values of ω and λ .

ω	λ	
1		(Homogeneous reservoir)
0.001		
0.001		
0.001		
0.001		
0.01		
0.01		
0.01		
0.01		
0.01		
0.1		
0.1		
0.1		
0.1		
0.1	10^{-9}	

t_D	q_D r_{eD} = 10
0.10	0.612890951D 01
0.20	0.447162694D 01
0.30	0.373605012D 01
0.40	0.329681239D 01
0.50	0.299657954D 01
0.60	0.277461936D 01
0.70	0.260185799D 01
0.80	0.246240454D 01
0.90	0.234673337D 01
0.10	0.224875161D 01
0.20	0.171522025D 01
0.30	0.147625203D 01
0.40	0.133248167D 01
0.50	0.123356754D 01
0.60	0.116001106D 01
0.70	0.110245557D 01
0.80	0.105576682D 01
0.90	0.101686455D 01
0.10	0.983770961D 00
0.20	0.800581107D 00
0.30	0.716198796D 00
0.40	0.664397555D 00
0.50	0.628180365D 00
0.60	0.600883717D 00
0.70	0.579271677D 00
0.80	0.561550652D 00
0.90	0.546625165D 00
0.10	0.533775416D 00
0.20	0.454200449D 00
0.30	0.400667749D 00
0.40	0.354670355D 00
0.50	0.314050151D 00
0.60	0.278090090D 00
0.70	0.246249493D 00
0.80	0.216055773D 00
0.90	0.193090616D 00
0.10	0.170983924D 00
0.20	0.506876365D-01
0.30	0.150230303D-01
0.40	0.444656682D-02
0.50	0.131613815D-02
0.60	0.395167924D-03
0.70	0.125510146D-03
0.80	0.448960609D-04
0.90	0.181973303D-04
0.10	0.697335839D-05

q_D FOR DIFFERENT VALUES OF r_{eD}

ω = 1 (HOMOGENEOUS)

q_D	q_D r_{eD} = 20
0.10 0-01	0.6128910120 01
0.20D-01	0.447162'7430 01
0.30D-01	0.373604909D 01
0.40D-01	0.329681329D 01
0.5010-01	0.299658078D 01
0.60D-01	0.277461930D 01
0.700-01	0.260185818D 01
0.80D-01	0.246240357D 01
0.90D-01	0.2346733920 01
0.10D 00	0.2248750780 01
0.20D 00	0.171522005D 01
0.3010 00	0.147625211D 01
0.40'0 00	0.133248196D 01
0.50D 00	0.123356761D 01
0.60D 00	0.116001120D 01
0.700 00	0.110245563D 01
0.80D 00	0.105576677D 01
0.900 00	0.1016864650 01
0.100 01	0.983770590D 00
0.20D 01	0.8005810290 00
0.30D 01	0.716198892D 00
0.40D 01	0.664397349D 00
0.50D 01	0.628180122D 00
0.60D 01	0.6008846000 00
0.70D 01	0.579277637D 00
0.800 01	0.561571797D 00
0.90D 01	0.5466847870 00
0.10D 02	0.533915937D 00
0.200 02	0.461139007D 00
0.30D 02	0.426101.5630 00
0.400 02	0.4039759240 00
0.500 02	0.388180886D 00
0.60D 02	0.3760785090 00
0.70D 02	0.366366795D 00
0.80D 02	0.358315629D 00
0.90D 02	0.3514775150 00
0.10D 03	0.3455600080 00
0.20D 03	0.272815388D 00
0.300 03	0.2197439340 00
0.400 03	0.1770012860 00
0.50D 03	0.1425733710 00
0.60D 03	0.1148418140 00
0.70D 03	0.925041797D-01
0.80D 03	0.7451137740-01
0.900 03	0.600185060D-01
0.10D 04	0.4834469450-01
0.20D 04	0.555411257D-02
0.30D 04	0.637887945D-03
0.40D 04	0.8063773490-04
0.500 04	0.1455087120-04
0.60D 04	0.1862801320-05

t_D	50	100	200	500
0.1 OD-01	0.612891012D 01	0.612891012D 01	0.612891012D 01	0.612891012~01
0.200-01	0.447162743D 01	0.447162743D 01	0.447162743D 01	0.447162743D 01
0.30D-01	0.373604909D 01	0.373604909D 01	0.373604909D 01	0.373604909D 01
0.40D-01	0.329681329D 01	0.329681329D 01	0.329681329D 01	0.329681329D 01
0.50D-01	0.299658078D 01	0.299658078D 01	0.299658078D 01	0.299658078D 01
0.60D-01	0.277461930D 01	0.277461930D 01	0.277461930D 01	0.277461930D 01
0.70D-01	0.260185818D 01	0.260185818D 01	0.260185818D 01	0.260185818D 01
0.80D-01	0.246240357D 01	0.246240357D 01	0.246240357D 01	0.246240357D 01
0.90D-01	0.234673392D 01	0.234673392D 01	0.234673392D 01	0.234673392D 01
0.1CD 00	0.224875078D 01	0.224875078D 01	0.224875078D 01	0.224875078D 01
0.200 00	0.171522005D 01	0.171522005D 01	0.171522005D 01	0.171522005D 01
0.30D G0	0.147625211D 01	0.147625211D 01	0.147625211D 01	0.147625211D 01
0.40D 00	0.133248196D 01	0.133248196D 01	0.133248196D 01	0.133248195D 01
0.533 00	0.123356761D 01	0.123356761D 01	0.123356761D 01	0.123356761D 01
0.60D 00	0.116001120D 01	0.116001120D 01	0.116001120D 01	0.116001120D 01
0.70D 00	0.110245563D 01	0.110245563D 01	0.110245563D 01	0.110245563D 01
0.80D 00	0.105576677D 01	0.105576677D 01	0.105576677D 01	0.105576677D 01
0.90D 00	0.101686465D 01	0.101686465D 01	0.101686465D 01	0.101686465D 01
0.10D 01	0.983770590D 00	0.983770590D 00	0.983770590D 00	0.983770590D 00
0.20D 01	0.800581029D 00	0.800581029D 00	0.800581029D 00	0.800581029D 00
0.30D 01	0.716198892D 00	0.716198892D 00	0.716198892D 00	0.716198892D 00
0.420 01	0.664397349D 00	0.664397349D 00	0.664397349D 00	0.664397349D 00
0.500 01	0.628180122D 00	0.628180122D 00	0.628180122D 00	0.628180122D 00
0.600 01	0.600884600D 00	0.600884600D 00	0.600884600D 00	0.600884600D 00
0.70D 01	0.579277637D 00	0.579277637D 00	0.579277637D 00	0.579277637D 00
0.80D 01	0.561571797D 00	0.561571797D 00	0.561571797D 00	0.561571797D 00
0.90D 01	0.546684787D 00	0.546684787D 00	0.546684787D 00	0.546684787D 00
0.10D 02	0.533915937D 00	0.533915937D 00	0.533915937D 00	0.533915937D 00
0.230 02	0.461139007D 00	0.461139007D 00	0.461139007D 00	0.461139007D 00
0.30D 02	0.426101563D 00	0.426101563D 00	0.426101563D 00	0.426101563D 00
0.40D 02	0.403975924D 00	0.403975924D 00	0.403975924D 00	0.403975924D 00
0.500 02	0.388180886D 00	0.388180886D 00	0.388180886D 00	0.388180886D 00
0.60D 02	0.376078509D 00	0.376078509D 00	0.376078509D 00	0.376078509D 00
0.70D 02	0.366366795D 00	0.366366795D 00	0.366366795D 00	0.366366795D 00
0.8CD 02	0.358315629D 00	0.358315629D 00	0.358315629D 00	0.358315629D 00
0.90D 02	0.351477515D 00	0.351477515D 00	0.351477515D 00	0.351477515D 00
0.10D 03	0.345560008D 00	0.345560008D 00	0.345560008D 00	0.345560008D 00
0.20D 03	0.310797551D 00	0.310797551D 00	0.310797551D 00	0.310797551D 00
0.30D 03	0.293338823D 00	0.293338823D 00	0.293338823D 00	0.293338823D 00
0.40D 03	0.282031802D 00	0.282031802D 00	0.282031802D 00	0.282031802D 00
0.50D 03	0.273813742D 00	0.273813742D 00	0.273813742D 00	0.273813742D 00
0.60D 03	0.267429118D 00	0.267429118D 00	0.267429118D 00	0.267429118D 00
0.700 03	0.262247967D 00	0.262247967D 00	0.2622479671) 00	0.262247967D 00
0.80D 03	0.251656723D 00	0.257912092D 00	0.257912092D 00	0.257912092D 00
0.90D 03	0.245371384D 00	0.254199736D 00	0.254199736D 00	0.254199736D 00
0.100 04	0.239289329D 00	0.250964413D 00	0.250964413D 00	0.250964413D 00
0.20D 04	0.186460285D 00	0.231505372D 00	0.231505372D 00	0.231505372D 00
0.30D 04	0.145318097D 00	0.221416640D 00	0.221416640D 00	0.221416640D 00
0.40D 04	0.113254286D 00	0.207054547D 00	0.214760047D 00	0.214760047D 00
0.50D 04	0.882650099D-01	0.196659256D 00	0.209858400D 00	0.209858400D 00
0.60D 04	0.687895261D-01	0.186808123D 00	0.206012019D 00	0.206012019D 00
0.70D 04	0.536113863D-01	0.1774537691) 00	0.202865404D 00	0.202865404D 00
0.80D a4	0.417824151D-01	0.168568451D 00	0.200214379D 00	0.200214379D 00
0.900 04	0.325635474D-01	0.160128315D 00	0.197931487D 00	0.197931487D 00
0.10D 05	0.253787544D-01	0.152110963D 00	0.195931933D 00	0.195931933D 00
0.20D 05	0.209399456D-02	0.910100607D-01	0.174219308D 00	0.183701652D 00
0.300 05	0.176010266D-03	0.544522783D-01	0.156198908D 00	0.177216927D 00
0.40D OS	0.197899338D-04	0.325797708D-01	0.140047108D 00	0.172881867D 00
0.500 05	0.273814607D-05	0.194933126D-01	0.125566097D 00	0.169660164D 00
0.60D 05		0.116629838D-01	0.1125825321) 00	0.167114168D 00
0.700 05		0.697715943D-02	0.100941391D 00	0.165019459D 00
0.80D 05		0.417290965D-02	0.905039094D-01	0.161367721D 00
0.900 05		0.249491523D-02	0.811456606D-01	0.158976314D 00
0.10D 06		0.149128930D-02	0.727550352D-01	0.156648388D 00
0.20D 06		0.130641998D-04	0.244258452D-01	0.135386995D 00
0.30D 06			0.820014571D-02	0.117033611D 00
0.40D 06			0.275075682D-02	0.101168679D 00
0.50D 06			0.921665524D-03	0.874543014D-01
0.600 06			0.309841493D-03	0.755989817D-01
0.700 06			0.106346732D-03	0.653507270D-01
0.80D 06			0.387338399D-04	0.564917667D-01
C.90D 06			0.156586012D-04	0.488336999D-01
0.10D 07			0.697790302D-05	0.422137951D-01

t_D	1000	2000	4000	10,000
0.10D-01	0.612891012D 01	0.6128910120 01	0.612891012D 01	0.6126910120 01
0.200-01	0.447162743D 01	0.4471627430 01	0.4471627430 01	0.447162743D 01
0.30D-01	0.373604909D 01	0.3736049090 01	0.3736049090 01	0.3736049090 01
0.40D-01	0.329681329D 01	0.3296813290 01	0.329681329D 01	0.329681329D 01
0.50D-01	0.299658078D 01	0.299658078D 01	0.299658078D 01	0.2996500780 01
0.60D-01	0.277461930D 01	0.2774619300 01	0.2774619300 01	0.277461930D 01
0.70D-01	0.260185818D 01	0.2601858180 01	0.2601858180 01	0.260185818D 01
0.80D-01	0.246240357D 01	0.2462403570 01	0.2462403570 01	0.2462403570 01
0.90D-01	0.234673392D 01	0.2346733920 01	0.2346733920 01	0.2346733920 01
0.100 00	0.224875078D 01	0.2248750780 01	0.2248750780 01	0.2248750780 01
0.20D 00	0.171522005D 01	0.1715220050 01	0.1715220050 01	0.1715220050 01
0.300 00	0.147625211D 01	0.1476252110 01	0.147625211D 01	0.1476252110 01
0.400 00	0.133248196D 01	0.1332481 96D 01	0.1332481960 01	0.1332481 960 01
0.500 00	0.123356761D 01	0.123356761D 01	0.1233567610 01	0.1233567610 01
0.600 00	0.116001120D 01	0.1160011200 01	0.1160011200 01	0.1160011200 01
0.700 00	0.110245563D 01	0.1102455630 01	0.1102455630 01	0.1102455630 01
0.800 00	0.105576677D 01	0.105576677D 01	0.1055766770 01	0.1055766770 01
0.90D 00	0.101686465D 01	0.1016864650 01	0.1016864650 01	0.1016864650 01
0.100 01	0.983770590D 00	0.9837705900 00	0.983770590D 00	0.9837705900 00
0.200 01	0.800581029D 00	0.8005810290 00	0.8005810290 00	0.80058102~000
0.350 01	0.716198892D 00	0.7161988920 00	0.7161989920 00	0.7161988920 00
0.40D 01	0.664397349D 00	0.6643973490 00	0.664397349D 00	0.6643973490 00
0.500 01	0.628180122D 00	0.6281801220 00	0.6281801220 00	0.6281801220 00
0.600 01	0.600884600D 00	0.6008846000 00	0.600884600D 00	0.6008846000 00
0.700 01	0.579277637D 00	0.579277637D 00	0.579277637D 00	0.579277637D 00
0.60D 01	0.561571797D 00	0.5615717970 00	0.5615717970 00	0.5615717970 00
0.900 01	0.546684787D 00	0.546684787D 00	0.546684787D 00	01.5466847870 00
0.100 02	0.533915937D 00	0.533915937D 00	0.533915937D 00	0.5339159370 00
0.200 02	0.461139007D 00	0.461139007D 00	0.461139007D 00	0.461139007D 00
0.300 02	0.426101563D 00	0.4261015630 00	0.4261015630 00	0.4261015630 00
0.40D 02	0.403975924D 00	0.4039759240 00	0.4039759241) 00	0.4039759240 00
0.500 02	0.388180886D 00	0.3881808860 00	0.388180886D 00	0.388180886D 00
0.600 02	0.376078509D 00	0.376078509D 00	0.3760785090 00	0.3760785090 00
0.700 02	0.366366795D 00	0.3663667950 00	0.3663667950 00	0.3663667950 00
0.80D 02	0.358315629D 00	0.3583156290 00	0.3583156290 00	0.358315629D 00
0.900 02	0.351477515D 00	0.3514775150 00	0.3514775150 00	0.3514775150 00
0.100 03	0.345560008D 00	0.3455600080 00	0.3455600080 00	0.3455600080 00
0.200 03	0.310797551D 00	0.3107975510 00	0.310797551D 00	0.310797551D 00
0.300 03	0.293338823D 00	0.293338823D 00	0.293338823D 00	0.293338823D 00
0.400 03	0.282031802D 00	0.2820318020 00	0.2820318020 00	0.2820318020 00
0.500 03	0.273813742D 00	0.273813742D 00	0.2738137420 00	0.2738137420 00
0.600 03	0.267429118D 00	0.2674291160 00	0.2674291 180 00	0.2674291 18D 00
0.700 03	0.262247967D 00	0.2622479670 00	0.2622479670 00	0.2622479670 00
0.80D 03	0.257912092D 00	0.2579120920 00	0.2579120920 00	0.2579120920 00
0.90D 03	0.254199736D 00	0.2541997360 00	0.2541997360 00	0.254199736D 00
0.100 04	0.250964413D 00	0.2509644130 00	0.2509644130 00	0.2509644130 00
0.200 04	0.231505372D 00	0.2315053720 00	0.2315053720 00	0.2315053720 00
0.30D 04	0.221416640D 00	0.2214166400 00	0.2214166400 00	0.2214166400 00
0.40D 04	0.214760047D 00	0.2147600470 00	0.2147600470 00	0.2147600470 00
0.500 04	0.209858400D 00	0.2098584000 00	0.2098584000 00	0.209858400D 00
0.600 04	0.206012019D 00	0.206012019D 00	0.2060120190 00	0.2060120190 00
0.700 04	0.202865404D 00	0.2028654040 00	0.202865404D 00	0.2028654040 00
0.80D 04	0.200214379D 00	0.2002 143790 00	0.2002143790 00	0,2002143790 00
0.90D 04	0.197931487D 00	0.1 97931487D 00	0.197931 4870 00	0.I97931487D 00
0.100 05	0.195931933D 00	0.1959319330 00	0.195931 9330 00	0.1959319330 00
0.200 05	0.183701652D 00	0.183701652D 00	0.1837016520 00	0.1837016520 00
0.300 05	0.177216927D 00	0.1772169270 00	0.177216927D 00	0.1772169270 00
0.400 05	0.172881867D 00	0.1 72881867D 00	0.1728818670 00	0.1728818670 00
0.500 05	0.169660164D 00	0.1696601640 00	0.1696601640 00	0.1696601640 00
0.600 05	0.167114168D 00	0.1671 141680 00	0.1671141680 00	0.167114168D 00
0.70D 05	0.165019459D 00	0.1650194590 00	0.1650194590 00	0.1650194590 00
0.800 05	0.163246263D 00	0.1632462630 00	0.1632462630 00	0.163246263D 00
0.900 05	0.161713050D 00	0.1617130500 00	0.1617130500 00	0.1617130500 00
0.100 06	0.160365371D 00	0.1603653710 00	0.1603653710 00	0.1603653710 00
0.200 06	0.152022912D 00	0.1520229120 00	0.1520229120 00	0.1520229120 00
0.30D 06	0.147528418D 00	0.147528418D 00	0.1475284160 00	0.1475284180 00
0.400 06	0.141595285D 00	0.1444955060 00	0.1444955060 00	0.1444955060 00
0.50D 06	0.137066877D 00	0.142226542D 00	0.1422265420 00	0.1422265420 00
0.600 06	0.132699487D 00	0.1404243160 00	0,1404243160 00	0.140424316D 00
0.70D 06	0.128474051D 00	0.1389354010 00	0.1389354010 00	0.1589354010 00

t_D	1000	2000	4000	10,000
0.80D 06	0.124383696D 00	0.137670705D 00	0.137670705D 00	0.137670705D 00
0.90D 06	0.120423684D 00	0.136573888D 00	0.136573888D 00	0.136573888D 00
0.10D 07	0.116589898D 00	0.1356073241) 00	0.1356073241) 00	0.135607324D 00
0.20D 07	0.843634245D-01	0.125408163D 00	0.129571297D 00	0.129571297D 00
0.30D 07	0.610444690D-01	0.116603942D 00	0.1262810800 00	0.1262810800 00
0.40D 07	0.441711151D-01	0.1084214470 00	0.124045352D 00	0.1240453520 00
0.500 07	0.319618280D-01	0.100813459D 00	0.122364511D 00	0.122364511D 00
0.60D 07	0.231274100D-01	0.937394285D-01	0.119449106D 00	0.121024360D 00
0.70D 07	0.167349911D-01	0.871617599D-01	0.1174713000 00	0.119913773D 00
0.80D 07	0.121094549D-01	0.810455949D-01	0.1155388250 00	0.118967973D 00
0.90D 07	0.876231526D-02	0.753586120D-01	0.113642589D 00	0.118145914D 00
0.10D 03	0.634011231D-02	0.700706741D-01	0.111778966D 00	0.117420068D 00
0.20D 08	0.248989323D-03	0.338508707D-01	0.947507773D-01	0.112857064D 00
0.30D 08	0.127609648D-04	0.163535322D-01	0.803174578D-01	0.110347584D 00
0.40D 08	0.765211811D-06	0.790052947D-02	0.6808266640-01	0.107128750D 00
0.50D 08		0.381608574D-02	0.5771156880-01	0.104616947D 00
0.60D 03		0.184229712D-02	0.489203078D-01	0.102175056D 00
0.70D 08		0.888861387D-03	0.414682372D-01	0.997922166D-01
0.80D 08		0.428930137D-03	0.351513587D-01	0.9746534890-01
0.900 08		0.207571768D-03	0.297967505D-01	0.951928264D-01
0.100 09		0.101338713D-03	0.2525783000-01	0.929733471D-01
0.20D 09			0.483791788D-02	0.734351900D-01
0.30D 09			0.924987304D-03	0.580028545D-01
0.40D 09			0.177321155D-03	0.4581360850-01
0.50D 09			0.359797810D-04	0.3618592430-01
0.600 09			0.886741022D-05	0.2858148510-01
0.70D 09			0.261912547D-05	0.225751706D-01
0.80D 09			0.3456293130-06	0.178311260D-01
0.90D 09				0.140840605D-01
0.10D 10				0.1112443230-01
0.20D 10				0.1049847150-02
0.30D 10				0.998336130D-04
0.40D 10				0.115607527D-04
0.50D 10				0.195361800D-05

$r_{eD} = \infty$

t_D	q_D	t_D	q_D	t_D	q_D
0.100-01	0.612891012D 01	0.10D 03	0.345560008D 00	0.10D 07	0.135607324D 00
0.203-01	0.447162743D 01	0.200 03	0.310797551D 00	0.20D 07	0.129571297D 00
0.30D-01	0.373604909D 01	0.303 03	0.293338823D 00	0.30D 07	0.126281080D 00
0.40D-01	0.329681329D 01	0.40D 03	0.282031802D 00	0.40D 07	0.124045352D 00
0.50D-01	0.299658078D 01	0.50D 03	0.273813742D 00	0.50D 07	0.122364511D 00
0.60D-01	0.277461930D 01	0.60D 03	0.267429118D 00	0.60D 07	0.121024360D 00
0.70D-01	0.260185818D 01	0.703 03	0.262247967D 00	0.70D 07	0.119913773D 00
0.80D-01	0.246240357D 01	0.80D 03	0.257912092D 00	0.80D 07	0.118967973D 00
0.90D-01	0.234673392D 01	0.90D 03	0.254199736D 00	0.90D 07	0.118145914D 00
0.10D 00	0.224875078D 01	0.10D 04	0.250964413D 00	0.10D 08	0.117420068D 00
0.20D 00	0.171522005D 01	0.20D 04	0.231505372D 00	0.20D 08	0.112857064D 00
0.30D 00	0.147625211D 01	0.30D 04	0.221416640D 00	0.30D 08	0.110347584D 00
0.40D 00	0.133248196D 01	0.403 04	0.214760047D 00	0.40D 08	0.108633293D 00
0.500 00	0.123356761D 01	0.50D 04	0.209858400D 00	0.50D 08	0.1073396140 00
0.60D 00	0.116001120D 01	0.60D 04	0.206012019D 00	0.60D 08	0.1063051120 00
0.70D 00	0.110245563D 01	0.70D 04	0.2028654040 00	0.70D 08	0.1054458060 00
0.80D 00	0.105576677D 01	0.800 04	0.200214379D 00	0.80D 08	0.104712525D 00
0.90D 00	0.101686465D 01	0.903 04	0.197931487D 00	0.90D 08	0.1040740910 00
0.10D 01	0.983770590D 00	0.10D 05	0.195931933D 00	0.10D 09	0.103509511D 00
0.20D 01	0.800581029D 00	0.20D 05	0.183701652D 00	0.10D 10	0.9994194651)-01
0.30D 01	0.716198892D 00	0.30D 05	0.177216927D 00	0.20D 10	0.979662737D-01
0.40D 01	0.664397349D 00	0.40D 05	0.172881867D 00	0.30D 10	0.966109931D-01
0.50D 01	0.628180122D 00	0.50D 05	0.1696601640 00	0.40D 10	0.955851822D-01
0.603 01	0.600884600D 00	0.630 05	0.167114168D 00	0.50D 10	0.947629927D-01
0.70D 01	0.579277637D 00	0.700 05	0.1650194590 00	0.60D 10	0.940787476D-01
0.80D 01	0.561571797D 00	0.80D 05	0.1632462630 00	0.70D 10	0.934939306D-01
0.90D 01	0.546684787D 00	0.90D 05	0.1617130500 00	0.80D 10	0.929840644D-01
0.10D 02	0.533915937D 00	0.10D 06	0.160365371D 00	0.90D 10	0.925326341D-01
0.20D 02	0.461139007D 00	0.20D 06	0.152022912D 00	0.10D 11	0.896682575D-01
0.30D 02	0.426101563D 00	0.300 06	0.147528418D 00		
0.40D 02	0.403975924D 00	0.400 06	0.144495506D 00		
0.50D 02	0.388180886D 00	0.50D 06	0.1422265420 00		
0.60D 02	0.376078509D 00	0.60D 06	0.140424316D 00		
0.70D 02	0.366366795D 00	0.70D 06	0.138935401D 00		
0.80D 02	0.358315629D 00	0.830 06	0.137670705D 00		
0.90D 02	0.351477515D 00	0.90D 06	0.136573888D 00		

q_D FOR DIFFERENT VALUES OF r_{eD} (ω = 0.01, $\lambda = 5x10^{-6}$)

t_D	10	20	50	100
0.100-01	0.716204071D 00	0.983773737D 00	0.983773737D 00	0.983773737D 00
0.200-01	0.664403354D 00	0.800585142D 00	0.8005851420 00	0.8005851420 00
0.300-01	0.628187232D 00	0.7162040710 00	0.7162040710 00	0.7162040710 00
0.400-01	0.600892255D 00	0.6644033540 00	0.6644033540 00	0.6644033540 00
0.500-01	0.579286039D 00	0.6281872320 00	0.6281872320 00	0.6281872320 00
0.600-01	0.561580849D 00	0.6008922550 00	0.6008922550 00	0.6008922550 00
0.700-01	0.546694641D 00	0.5792860390 00	0.579286039D 00	0.5792860390 00
0.800-01	0.533926254D 00	0.5615808490 00	0.5615808490 00	0.561580849D 00
0.900-01	0.461154521D 00	0.5466946410 00	0.5466946410 00	0.5466946410 00
0.100 00	0.426121422D 00	0.5339262540 00	0.533926254D 00	0.5339262540 00
0.200 00	0.354700988D 00	0.4611545210 00	0.4611545210 00	0.4611545210 00
0.300 00	0.314090004D 00	0.4261214220 00	0.4261214220 00	0.4261214220 00
0.400 00	0.278139879D 00	0.4039935730 00	0.4039995730 00	0.4039995730 00
0.500 00	0.246309587D 00	0.3882080220 00	0.3882080220 00	0.388208022D 00
0.600 00	0.218126417D 00	0.3761089630 00	0.376108963D 00	0.3761089630 00
0.700 00	0.193171832D 00	0.3664004310 00	0.3664004310 00	0.3664004310 00
0.800 00	0.171075584D 00	0.3583523300 00	0.3583523300 00	0.3583523300 00
0.900 00	0.508635083D-01	0.3515170590 00	0.3515170590 00	0.351517059D 00
0.100 01	0.152416984D-01	0.3456023210 00	0.3656023210 00	0.3456023210 00
0.200 01	0.468323403D-02	0.2729093690 00	0.3108646560 00	0.3108646560 00
0.300 01	0.155972046D-02	0.2199038060 00	0.293427413D 00	0.2934274130 00
0.400 01	0.641158143D-03	0.1772355160 00	0.2621399740 00	0.2821399740 00
0.500 01	0.372396060D-03	0.1428846760 00	0.2739402960 00	0.2739402960 00
0.600 01	0.292144032D-03	0.1152290010 00	0.2675731070 00	0.267573107D 00
0.700 01	0.265504917D-03	0.9296360860-01	0.2624087180 00	0.2624087180 00
0.800 01	0.254336600D-03	0.750380870D-01	0.2518533940 00	0.2580890840 00
0.900 01	0.245013530D-03	0.606064823D-01	0.2455947060 00	0.2543924040 00
0.100 02	0.248691547D-03	0.4898791700-01	0.239541487D 00	0.251172441D 00
0.200 02	0.248254320D-03	0.6481308140-02	0.1871015710 00	0.231851977D 00
0.300 02	0.247674119D-03	0.162215927D-02	0.1464661460 00	0.2218864840 00
0.400 02	0.247381309D-03	0.1074143460-02	0.1149552030 00	0.2077556410 00
0.500 02	0.247262350D-03	0.1009304040-02	0.9051923840-01	0.1975913090 00
0.600 02	0.247212510D-03	0.9967493410-03	0.7156994030-01	0.1880071090 00
0.700 02	0.247199796D-03	0.9920422890-03	0.568754901D-01	0.1789515930 00
0.800 02	0.247196520D-03	0.990492689D-03	0.454805428D-01	0.1703930220 00
0.900 02	0.247147394D-03	0.9907054030-03	0.366441199D-01	0.1623037480 00
0.100 03	0.247031407D-03	0.9916664160-03	0.2979169760-01	0.1546580750 00
0.200 03	0.246907129D-03	0.9951732800-03	0.7979750090-02	0.9784309300-01
0.300 03	0.246781518D-03	0.9939522780-03	0.6268969510-02	0.6550456720-01
0.400 03	0.246657538D-03	0.9932541760-03	0.6133288340-02	0.4709635560-01
0.500 03	0.246531458D-03	0.9927284540-03	0.6115577880-02	0.3661545650-01
0.600 03	0.246406978D-03	0.9922473410-03	0.610839819D-02	0.306454151D-01
0.700 03	0.246283669D-03	0.9917579400-03	0.6104334330-02	0.272424312D-01
0.800 03	0.246159381D-03	0.9912745360-03	0.6101780060-02	0.2530087830-01
0.900 03	0.244918703D-03	0.990781453D-03	0.6099718060-02	0.241917080D-01
0.100 04	0.243685693D-03	0.9902901280-03	0.6097605780-02	0.2355662910-01
0.200 04	0.242458347D-03	0.9853217760-03	0.6068745770-02	0.2263482400-01
0.300 04	0.241237394D-03	0.980370232D-03	0.603836770D-02	0.2252270530-01
0.400 04	0.240022535D-03	0.975441531D-03	0.6008479090-02	0.2242006230-01
0.500 04	0.238813742D-03	0.9705384850-03	0.5978805350-02	0.2231838490-01
0.600 04	0.237611175D-03	0.9656593050-03	0.594927949D-02	0.2221635560-01
0.700 04	0.236414644D-03	0.9609053810-03	0.591989808D-02	0.2211432430-01
0.800 04	0.235224150D-03	0.9559761900-03	0.5890660230-02	0.2201258980-01
0.900 04	0.223643624D-03	0.9511710100-03	0.5861561480-02	0.219112888D-01
0.100 05	0.212633161D-03	0.946389989D-03	0.583260578D-02	0.2181046610-01
0.200 05	0.202164869D-03	0.899881554D-03	0.555078040D-02	0.2082825350-01
0.300 05	0.192211897D-03	0.855658890D-03	0.528256769D-02	0.198905105D-01
0.400 05	0.182748916D-03	0.813609429D-03	0.502731567D-02	0.1899498500-01
0.500 05	0.173751841D-03	0.7736261090-03	0.478439783D-02	0.1813977720-01
0.600 05	0.165197691D-03	0.735607903D-03	0.4553217730-02	0.1732307430-01
0.700 05	0.157064730D-03	0.699458079D-03	0.4333207050-02	0.165431418D-01
0.800 05	0.149332108D-03	0.6650847960-03	0.4123828690-02	0.1579833100-01
0.900 05	0.901361507D-04	0.6324006600-03	0.3924567750-02	0.1508705510-01
0.100 06	0.544058059D-04	0.601322468D-03	0.373493347D-02	0.1440780150-01
0.200 06	0.328394781D-04	0.363295492D-03	0.2276117090-02	0.9089412670-02
0.300 06	0.198222282D-04	0.219489112D-03	0.1387097360-02	0.5734319050-02
0.400 06	0.119646187D-04	0.132608315D-03	0.845327194D-03	0.361775442D-02
0.500 06	0.722097488D-05	0.801185849D-04	0.515167200D-03	0.2282490350-02
0.600 06	0.435708363D-05	0.484046433D-04	0.3139534160-03	0.1440080370-02
0.700 06	0.262819253D-05	0.292409662D-04	0.191311493D-03	0.9085502750-03
0.800 06	0.158489956D-05	0.176604372D-04	0.1165548980-03	0.5731430850-03
0.900 06			0.7098897410-04	0.3614848420-03
0.100 07			0.4322420250-04	

t_D	200	500	1000	2000
0.100-01	0.9837737370 00	0.9837737370 00	0.9837737370 00	0.9837737370 00
0.200-01	0.8005851420 00	0.8005851420 00	0.8005851420 00	0.8005851420 00
0.300-01	0.7162040710 00	0.7162040710 00	0.7162040710 00	0.7162040710 00
0.400-01	0.6444033540 00	0.6644033540 00	0.6644033540 00	0.6644033540 00
0.500-01	0.6281872320 00	0.6281872320 00	0.6281872320 00	0.6281872320 00
0.600-01	0,6008922550 00	0.6008922550 00	0.6008922550 00	0.6008922550 00
0.700-01	0.5792860390 00	0.5792860390 00	0.5792860390 00	0.5792860390 00
0.800-01	0.5615808490 00	0.5615808490 00	0.5615808490 00	0.5615808490 00
0.900-01	0.5466946410 00	0.5466946410 00	0.5466946410 00	0.5466946410 00
0.100 00	0.6339262540 00	0.5339262540 00	0.5339262540 00	0.5339262540 00
0.200 00	0.461 1545210 00	0.4611545210 00	0.4611545210 00	0.4611545210 00
0.300 00	0.4261214220 00	0.4261214220 00	0.4261214220 00	0.4261214220 00
0.400 00	0.4039995730 00	0.4039995730 00	0.6039995730 00	0.4039995730 00
0.500 00	0.5862080220 00	0.3862080220 00	0.3882080220 00	0.3882080220 00
0.600 00	0.3761089630 00	0.3761089630 00	0.3761069630 00	0.376108963~00
0.700 00	0.3664004310 00	0.3664004310 00	0.3664004310 00	0.3664004310 00
0.800 00	0.3583523300 00	0.3583523300 00	0.3533523300 00	0.3583523300 00
0.900 00	0.9515170590 00	0.3515170590 00	0.3515170590 00	0.3515170590 00
0.100 01	0.3456023210 00	0.3456023210 00	0.3456023210 00	0.3456023210 00
0.200 01	0.3108646560 00	0.3108646560 00	0.3108646560 00	0.3108646560 00
0.300 01	0.2334274130 00	0.2934274130 00	0.2934274130 00	0.2934274130 00
0.400 01	0.2821399740 00	0.2821399740 00	0.2821399740 00	0.2821399740 00
0.500 01	0.2739402960 00	0.2739402960 00	0.2739402960 00	0.2739402960 00
0.600 01	0.2675731070 00	0.2675731070 00	0.2675731070 00	0.2675731070 00
0.700 01	0.2624087180 00	0.2624087180 00	0.2624087180 00	0.26240871 80 00
0.800 01	0.2580890840 00	0.2580890840 00	0.2580890840 00	0.2580890840 00
0.900 01	0.2543924040 00	0.2543924040 00	0.2543924040 00	0.2543924040 00
0.100 02	0.2511724410 00	0.2511724410 00	0.2511724410 00	0.2511724410 00
0.200 02	0.2318519770 00	0.2316519770 00	0.2318519770 00	0.2318519770 00
0.300 02	0.2218864840 00	0.2218864840 00	0.22 18864840 00	0.2218864640 00
0.400 02	0.2153444000 00	0.2153444000 00	0.2153444000 00	0.2153444000 00
0.500 02	0.2105512350 00	0.2105512350 00	0.2105512350 00	0.2105512350 00
0.600 02	0.2068087870 00	0.2068087870 00	0.2068087870 00	0.2068087870 00
0.700 02	0.2037625410 00	0.2037625410 00	0.2037425410 00	0.2057625410 00
0.800 02	0.2012088700 00	0.2012088900 00	0.2012088900 00	0.2012089900 00
0.900 02	0.1990207540 00	0.1990207540 00	0.1990207540 00	0.1990207540 00
0.100 03	0.1971138310 00	0.1371138310 00	0.1971138310 00	0.1371138310 00
0.200 03	0.1769163250 00	0.1857268360 00	0.1857268360 00	0.1857268360 00
0.300 03	0.1610025130 00	0.1799909950 00	0.1799909950 00	0.1799909950 00
0.400 03	0.1474332210 00	0.1763448910 00	0.1763448910 00	0.1763448910 00
0.500 03	0.1358593000 00	0.1737674310 00	0.1737674310 00	0.1737674310 00
0.600 03	0.1259863510 00	0.1718295760 00	0.1718295760 00	0.1718295760 00
0.700 03	0.1 175637430 00	0.1703124210 00	0.1703124210 00	0.1703124210 00
0.800 03	0.1103779660 00	0.1677232920 00	0.16909021 90 00	0.1690902190 00
0.900 03	0.1042468300 00	0.1661565310 00	0.1680843569 00	0.1680843560 00
0.100 04	0.9901508910-01	0.1647051840 00	0.1672427190 00	0.16724271 90 00
0.200 04	0.3475108180-01	0.1544383350 00	0.1630892720 00	0.1630892720 00
0.300 04	0.6962666680-01	0.1490028550 00	0.1617130870 00	0.1617130870 00
0.400 04	0.8839759280-01	0.146081 9270 00	0.1604597520 00	0.1611173450 00
0.500 04	0.6796175010-01	0.1444739120 00	0.1599112350 00	0.1608138660 00
0.600 04	0.6768587380-01	0.1435516580 00	0.1595566900 00	0.1606352300 00
0.700 04	0.6744185990-01	0.1429878030 00	0.1595198460 00	0.1605142100 00
0.800 04	0.6720475710-01	0.1426113760 00	0.1591474750 00	0.1604211480 00
0.900 04	0.6697004860-01	0.1423330740 00	0.1590140480 0D	0.1603422080 00
0.100 05	0.6673689910-01	0.1421061610 00	0.1589034690 00	0.1602705830 00
0.200 05	0.6445845880-01	0.1403448490 00	0.15807935713 00	0.1596201220 00
0.300 05	0.6225655310-01	0.1386675110 00	0.1573134090 00	0.1590095200 00
0.400 05	0.6012978860-01	0.13701 44400 00	0.15656249911 00	0.1584159350 00
0.500 05	0.5805592990-01	0.1353841690 00	0.1558250770 00	0.1578386920 00
0.600 05	0.516 09239390-01	0.1337762020 00	0.1551007470 00	0.1572772060 00
0.700 05	0.5617673440-01	0.1321901949 00	0.1543889840 00	0.1567308850 00
0.800 05	0.5232662020-01	0.1306257860 00	0.1536893710 on	0.1561992320 00
0.900 05	0.5053980720-01	0.1290825439 00	0.1530014430 00	0.1556816910 00
0.100 06	0.41381409960-01	0.1275600380 00	0.1523247520 00	0.1551777550 00
0.200 06	0.3449142900-01	0.1133962990 00	0.1460928280 00	0.1507899420 00
0.300 06	0.26375631 70-01	0.1009414940 00	0.1406207370 00	0.1473334310 00
0.400 06	0.1722934590-01	0.8993931270-01	0.1356873910 00	0.1445371 350 00
0.500 06	0.1217983660-01	0.8018887940-01	0.1311475120 00	0.1422143600 00
0.600 06	0.8611270550-02	0.7152807890-01	0.1269048810 00	0.1402352570 00
0.700 06	0.6088891210-02	0.6382284850-01	0.1228954450 00	0.1385086090 00
0.800 06	0.4305705730-02	0.5696020020-01	0.11 90760340 00	0.1369696410 00
0.900 06	0.3044875150-02	0.5084319570-01	0.1154171840 00	0.1355718110 00
0.100 07	0.2153249550-02	0.4538791710-01	0.1118984740 00	0.1342814540 00

t_D	200	500	1000	2000
0.20D 07	0.677096682D-04	0.146 164157D-01	0.824517928D-01	0.1240015110 00
0.30D 07	0.324262986D-05	0.470901343D-02	0.608224285D-01	0.1153280500 00
0.400 07		0.1515648720-02	0.4486820450-01	0.1073362850 00
0.500 07		0.4873515800-03	0.3309904790-01	0.9990565140-01
0.600 07		0.1576193170-03	0.2441712890-01	0.9299015100-01
0.700 07		0.5253510240-04	0.180125937D-01	0.8655341920-01
0.80D 07		0.1893238620-04	0.1328800870-01	0.8056231850-01
0.90D 07			0.980260784D-02	0.749859230D-01
0.100 08			0.7231277795-02	0.6979552460-01
0.200 08			0.344040481D-03	0.340647394D-01
0.300 08				0.1662607200-01
0.40D 08				0.8114805970-02
0.50D 08				0.395998667D-02
0.600 08				0.1931527140-02
0.700 08				0.9415530280-03
0.800 08				0.4589915710-03

t_D	4,0100	10,000	∞
0.10D-01	0.983773737D 00	0.9837737370 00	
0.200-01	0.800585142D 00	0.8005851420 00	0.8005851420 00
0.300-01	0.716204071D 00	0.7162040710 00	0.7162040710 00
0.403-01	0.664403354D 00	0.6644033540 00	0.6644033540 00
0.50D-01	0.628187232D 00	0.6281872320 00	0.6281872320 00
0.600-01	0.6008~2255000	0.6008922550 00	0.6008922550 00
0.70D-01	0.579286039D 00	0.579286039D 00	0.5792860390 00
0.800-01	0.561580849D 00	0.5615808490 00	0.5615808490 00
0.90D-01	0.5466846410 00	0.5466946410 00	0.5466946410 00
0.100 00	0.533926254D 00	0.5339262540 00	0.5339262540 00
0.200 00	0.461154521D 00	0.4411545210 00	0.4611545210 00
0.30D 00	0.426121422D 00	0.4261214220 00	0.426121422D 00
0.400 00	0.4039995730 00	0.4039995730 00	0.4039995730 00
0.500 00	0.388208022D 00	0.3882080220 00	0.3882080220 00
0.60D 00	0.376108963D 00	0.376 1089630 00	0.3761089630 00
0.70D 00	0.366400431D 00	0.3664004310 00	0.3664004310 00
0.800 00	0.358352330D 00	0.3583523300 00	0.3583523300 00
0.90D 00	0.3515170590 00	0.3515170590 00	0.3515170590 00
0.10D 01	0.3456423210 00	0.345602321D 00	0.3456023210 00
0.200 01	0.3108646560 00	0.3108646560 00	0.3108646560 00
0.300 01	0.2934274130 00	0.2934274130 00	0.2934274130 00
0.400 01	0.282139974D 00	0.2821 399740 00	0.2821399740 00
0.500 01	0.2739402960 00	0.2739402960 00	0.2739402960 00
0.600 01	0.267573107D 00	0.267573107D 00	0.2675731070 00
0.700 01	0.262408718D 00	0.2624087180 00	0.2624087180 00
0.800 01	0.25808190840 00	0.2580890840 00	0.2580890840 00
0.90D 01	0.2543924040 00	0.2543924040 00	0.2543924040 00
0.10D 02	0.251 17'24410 00	0.251 1724410 00	0.2511724410 00
0.200 02	0.231851977D 00	0.2318519770 00	0.2318519770 00
0.300 02	0.221886484D 00	0.2218864840 00	0.2218864840 00
0.40D 02	0.215344400D 00	0.2153444000 00	0.215344400D 00
0.500 02	0.2105512350 00	0.2105512350 00	0.2105512350 00
0.600 02	0.206808787D 00	0.2068087870 00	0.2068087870 00
0.70D 02	0.203762541D 00	0.2037625410 00	0.2037625410 00
0.80D 02	0.201208890D 00	0.2012088900 00	0.2012088900 00
0.90D 02	0.199020754D 00	0.1990207540 00	0.1990207540 00
0.10D 03	0.197113831D 00	0.197113831D 00	0.1971138310 00
0.200 03	0.1857248360 00	0.1857268360 00	0.1857268360 00
0.30D 03	0.1799949950 00	0.1799909950 00	0.1799909950 00
0.40D 03	0.1763448910 00	0.1763448910 00	0.1763448910 00
0.500 03	0.173767431D 00	0.1737674310 00	0.173767431D 00
0.600 03	0.171 8295760 00	0.1718295760 00	0.1718295760 00
0.700 03	0.1703184210 00	0.170312421D 00	0.1703124210 00
0.800 03	0.1690962190 00	0.1690902190 00	0.1690902190 00
0.900 03	0.1680843560 00	0.1680843560 00	0.1680843560 00
0.100 04	0.1672447190 00	0.16724271 9D 00	0.16724271 9D 00
0.200 04	0.1630842720 00	0.1630892720 00	0.1630892720 00
0.300 04	0.16171 0870 00	0.1617130870 00	0.1617130870 00
0.40D 04	0.1611143650 00	0.1611173650 00	0.1611173650 00
0.50D 04	0.160813866D 00	0.1608136660 00	0.160813866D 00
0.605 04	0.160635230D 00	0.1606352300 00	0.1606352300 00

q_D FOR DIFFERENT VALUES OF r_{eD} ($\omega = 0.001$, $\lambda = 10^{-9}$)

t_D	r_{eD} 10	20	50
0.100-01	0.5339159240 00	0.5339159240 00	0.5339159240 00
0.200-01	0.4611390790 00	0.4611390790 00	0.4611390790 00
0.30D-01	0.426101589D 00	0.4261015590 00	0.4261015890 00
0.40D-01	0.354670287D 00	0.4039759570 00	0.4039759570 00
0.50D-01	0.314050149D 00	0.3651 80885D 00	0.3581 80885D 00
0.60 D-01	0.278089990D 00	0.376078417D 00	0.376078417D 00
0.70 D-01	0.2146249510 00	0.3663666650 00	0.3663668650 00
0.800-01	0.2180557440 00	0.3583156060 00	0.358315606D 00
0.90D-01	0.193090636D 00	0.3514774850 00	0.3514774850 00
0.100 00	0.170983949D 00	0.3455600000 00	0.345560000D 00
0.200 00	0.506876467D-01	0.2728153710 00	0.31 0797595D 00
0.30D 00	0.150230488D-01	0.219743978D 00	0.2933388570 00
0.400 00	0.4846574060-02	0.3770013360 00	0.282031816D 00
0.50D 00	0.1 31618881D-02	0.1425734590 00	0.2738137090 00
0.600 00	0.3 951706680-03	0.1149418790 00	0.2674291720 00
0.700 00	0.1 254888090-03	0.925042764D-01	0.2622479850 00
0.800 00	0.4 496998050-04	0.745115121D-01	0.251 656791D 00
0.900 00	0.182434212D-04	0.600186327D-01	0.2453714450 00
0.100 01	0.7 054823420-05	0.483448515D-01	0.2392893920 00
0.200 01		0.555428681D-02	0.1864603960 00
0.300 01		0.6380635420-03	0.145318292D 00
0.40 D 01		0.808216574D-04	0.113254631D 00
0.500 01		0.1474315110-04	0.8826546750-01
0.600 01		0.205145692D-05	0.6879009560-01
0.700 01			0.5361204800-01
0.80 D 01			0.41 7831795D-01
0.900 01			0.3256434010-01
0.10 D 02			0.2537965050-01
0.200 02			0.2095205800-02
0.300 02			0.1772619740-03
0.400 02			0.210298098D-04
0.500 02			0.399359103D-05

t_D	100	200	500	1000
0.1 0D-01		0.533915924D 00	0.53391 5924D 00	0.5339159240 00
0.20 D-01		0.4611390790 00	0.4611330790 00	0.4611390790 00
0.30 D-01		0.4261015890 00	0.4261015890 00	0.4261015890 00
0.40'0-01		0.4039759570 00	0.4039759570 00	0.4039759570 00
0.50 D-01		0.388180885D 00	0.3881808850 00	0.3861808850 00
0.60 D-01		0.3760784170 00	0.3760754170 00	0.3760754170 00
0.70 D-01	0.366 66865D 00	0.366366865D 00	0.366366865D 00	0.366366865D 00
0.80 D-01	0.358 156060 00	0.3563156060 00	0.35831 5606D 00	0.3553156060 00
0.90 D-01	0.351 774850 00	0.3514774850 00	0.3514774850 00	0.3514774850 00
0.10 D 00	0.345 600000 00	0.3455600000 00	0.3455600000 00	0.3455600000 00
0.200 00	0.310 975950 00	0.3107975950 00	0.3107975950 00	0.31 0797595D 00
0.360 00	0.293 388570 00	0.293338857D 00	0.2933388570 00	0.2933356570 00
0.40 D 00	0.282 318160 00	0.2820318160 00	0.2820318160 00	0.2820318160 00
0.500 00	0.273 137990 00	0.2738137990 00	0.27381 37990 00	0.2738137990 00
0.600 00	0.267 291720 00	0.2674291720 00	0.2674291720 00	0.2674291720 00
0.700 00	0.262 479550 00	0.262247985D 00	0.2622479350 00	0.262247985D 00
0.800 00	0.2579121330 00	0.257912133 00	0.2579121330 00	0.257912133D 00
0.90 D 00	0.2541 997720 00	0.2541 997720 00	0.2541997720 00	0.2541997720 00
0.100 01	0.250964481D 00	0.2509644810 00	0.2509644810 00	0.2509644810 00
0.200 01	0.2315054460 00	0.231505446D 00	0.2315054460 00	0.2315054460 00
0.300 01		0.2214167020 00	0.2214167020 00	0.2214167020 00
0.400 01		0.2147601660 00	0.2147601660 00	0.2147601660 00
0.50 D 01		0.209858512D 00	0.2098585120 00	0.20985851 20 00
0.60 D 01		0.2060121770 00	0.2060121770 00	0.206012177D 00
0.70 D 01		0.202865567D 00	0.2028655670 00	0.202865567D 00
0.800 01		0.2002146050 00	0.2002146050 00	0.200214605D 00
0.900 01		0.1979316760 00	0.197931 676D 00	0.1979316760 00
0.100 02		0.195932167D 00	0.1959321670 00	0.1959321470 00
0.20 D 02		0.1742198710 00	0.1837020690 00	0.1837020690 00
0.300 02		0.1561999050 00	0.177217497D 00	0.1772174970 00
0.40 D 02	0.325828360D-01	0.1400486760 00	0.172882597D 00	0.172882597D 00
0.500 02	0.194969487D-01	0.1 255683340 00	0.1696610350 00	0.169661035D 00

t_D	4,000	10,000	∞
0.700 04	0.160514210D 00	0.160514210D 00	0.160514210D 00
0.800 04	0.160421148D 00	0.160421148D 00	0.160421148D 00
0.900 04	0.160342208D 00	0.1603422080 00	0.160342208D 00
0.100 05	0.160270583D 00	0.1602705830 00	0.160270583D 00
0.200 05	0.159635617D 00	0.1596356170 00	0.159635617D 00
0.300 05	0.159028097D 00	0.1590280970 00	0.159028097D 00
0.400 05	0.158437814D 00	0.1584378140 00	0.158437814D 00
0.500 05	0.157864068D 00	0.157864068D 00	0.157864068D 00
0.600 05	0.157306296D 00	0.1573063000 00	0.157306300D 00
0.700 05	0.156763898D 00	0.1567639110 00	0.156763911D 00
0.800 05	0.156236398D 00	0.1562364020 00	0.156236402D 00
0.900 05	0.155723236D 00	0.1557232480 00	0.155723248D 00
0.100 06	0.155223938D 00	0.1552239350 00	0.155223935D 00
0.200 06	0.150895623D 00	0.1508956650 00	0.150895665D 00
0.300 06	0.147524670D 00	0.1475247970 00	0.147524797D 00
0.400 06	0.1448[illegible]908D 00	0.1448421820 00	0.144842173D 00
0.500 06	0.14266[illegible]7690 00	0.1426623000 00	0.142662293D 00
0.600 06	0.1408 [illegible] 9250 00	0.140855858D 00	0.140855855D 00
0.700 06	0.13933[illegible]1 270 00	0.1393316630 00	0.139331665D 00
0.800 06	0.138022085D 00	0.138024468D 00	0.138024485D 00
0.900 06	0.13688[illegible]429D 00	0.1368870040 00	0.136887001D 00
0.100 07	0.13587 [illegible] 3440 00	0.1358844870 00	0.135884471D 00
0.200 07	0.12962 [illegible] 6930 00	0.1296842300 00	0.129684231D 00
0.300 07	0.12610[illegible]2720 00	0.126348738D 00	0.126348733D 00
0.400 07	0.12347[illegible]7250 00	0.1240927320 00	0.124092757D 00
0.500 07	0.12122 5 394D 00	0.1224006 15D 00	0.122400640D 00
0.600 07	0.11914 5 0390 00	0.1210533130 00	0.121053337D 00
0.700 07	0.11715 6 1500 00	0.11 9937732D 00	0.119937873D 00
0.800 07	0.11522 4 1870 00	0.1189881460 00	0.118988515D 00
0.900 07	0.11333 4 1400 00	0.118162855D 00	0.118163780D 00
0.100 08	0.11147~3100 00	0.11 74338570 00	0.117435821D 00
0.200 08	0.945456761D-01	0.1127450830 00	0.112864021D 00
0.300 08	0.801863122D-01	0.109725332D 00	0.110351913D 00
0.400 08	0.680078171D-01	0.1070872700 00	0.108636400D 00
0.500 08	0.576789094D-01	0.1045751420 00	0.107342006D 00
0.600 08	0.489187255D-01	0.1021347170 00	0.106307050D 00
0.700 08	0.414890274D-01	0.9975378270-01	0.105447431D 00
0.800 08	0.351877475D-01	0.974288312D-01	0.104713912D 00
0.900 08	0.298435121D-01	0.951581948D-01	0.104075304D 00
0.100 09	0.25310 [illegible]776D-01	0.9294052780-01	0.103510589D 00
0.200 09	0.48740 [illegible]6410-02	0.7341725600-01	0.999424404D-01
0.300 09	0.93691 [illegible]74D-03	0.579950223D-01	0.979665729D-01
0.400 09	0.18053 [illegible]302D-03	0.4581240720-01	0.966112126D-01
0.500 09	0.367552015D-04	0.3618891830-01	0.955853519D-01
0.600 09	0.905730367D-05	0.285869804D-01	0.947631363D-01
0.700 09		0.225819695D-01	0.940788636D-01
0.803 09		0.178384222D-01	0.934940325D-01
0.900 09		0.140913678D-01	0.929841476D-01
0.100 10		0.111314221D-01	0.925327099D-01
0.200 10		0.1051662140-02	0.896682981D-01
0.300 10		0.1001096590-03	0.880731629D-01
0.403 10			0.869752542D-01
0.500 10			0.861422554D-01
0.600 10			0.854733548D-01
0.700 10			0.849158348D-01
0.800 10			0.844387110D-01
0.900 10			0.840222732D-01
0.100 11			0.836532042D-01

t_D	100	200	500	1000
0.60D 02	0.116670471D-01	0.112585442D 00	0.167115170D 00	0.1671 151170D 00
0.70D 02	0.698152419D-02	0.1009450793 00	0.165020609D 00	0.165020609D 00
0.80D 02	0.417750583D-02	0.905083989D-01	0.1613691270 00	0.163247554D 00
0.90D 02	0.249964550D-02	0.81 15091340-01	0.158977898D 00	0.161 714447D 00
0.10D 03	0.149609861D-02	0.7276108890-01	0.156650202D 00	0.160366893D 00
0.20D 03	0.180546801D-04	0.244387377D-01	0.135391980D 00	0.1520256480 00
0.30D 03	0.306256221D-05	0.821694716D-02	0.117043146D 00	0.147532268D 00
0.40D 03	0.276217785D-05	0.276940247D-02	0.101183770D 00	0.141601 088D 00
0.50D 03	0.434300572D-05	0.9411297140-03	0.874755537D-01	0.137074700D 00
0.60D 03	0.527145323D-05	0.329613882D-03	0.7562670850-01	0.1327096960 00
0.70D 03	0.557188984D-05	0.126264495D-03	0.653851327D-01	0.1284870 13D 00
0.80D 03	0.556698094D-05	0.586988163D-04	0.565327732D-01	0.124399719D 00
0.90D 03	0.545517924D-05	0.356435100D-04	0.488312173D-01	0.120443097D 00
0.10D 04	0.532984050D-05	0.269779391D-04	0.4226761 93D-01	0.116612924D 00
0.20D 04	0.495916548D-05	0.184283181D-04	0.993457606D-02	0.844338860D-01
0.300 04	0.497819309D-05	0.2037408640-04	0.240628839D-02	0.611725388D-01
0.40D 04	0.499073256D-05	0.204413194D-04	0.6546661 19D-03	0.443576845D-01
0.50D 04	0.499666872D-05	0.202215743D-04	0.249793980D-03	0.322028843D-01
0.60D 04'	0.499869599D-05	0.20072798313-04	0.156849719D-03	0.234166960D-01
0.70D 04	0.499963682D-05	0.2000 13109D-04	0.1347130100-03	0.170655201D-01
0.80D 04	0.500016621D-05	0.19971 06930-04	0.128262849D-03	0.124744231D-01
0.90D 04	0.499979097D-05	0.1996417030-04	0.125527566D-03	0.915550968D-02
0.10D OS	0.500019210D-05	0.199622124D-04	0.124036506D-03	0.675614161D-02
0.20D 05	0.499929015D-05	0.199914591D-04	0.124951356D-03	0.741790125D-03
0.30D 05	0.499945076D-05	0.1999662760-04	0.125279458D-03	0.510877162D-03
0.40D 05	0.499936135D-05	0.199973630D-04	0.125044703D-03	0.499158419D-03
0.50D 05	0.499913459D-05	0.199970077D-04	0.124925221D-03	0.496937392D-03
0.60D 05	0.499915871D-05	0.199971268D-04	0.124887288D-03	0.496846372D-03
0.70D 05	0.499904661D-05	0.199963839D-04	0.124876965D-03	0.497451686D-03
0.80D 05	0.499904687D-05	0.199962315D-04	0.124878477D-03	0.498056793D-03
0.90D 05	0.499889794D-05	0.199961222D-04	0.124879653D-03	0.498461916D-03
0.10D 06	0.499891645D-05	0.199957051D-04	0.124884349D-03	0.4986868990-03
0.20D 06	0.499837364D-05	0.1999362360-04	0.1248881 300-03	0.498426642D-03
0.300 06	0.499789702D-05	0.199916526D-04	0.124876855D-03	0.498293782D-03
0.40D 06	0.499740039D-05	0.19989641 9D-04	0.12485441 5D-03	0.498248618D-03
0.50D 06	0.499690818D-05	0.199877101D-04	0.124852410D-03	0.498208618D-03
0.600 06	0.499639957D-05	0.199856641D-04	0.124839514D-03	0.498163193D-03
0.700 06	0.499589193D-05	0.199836452D-04	0.124826730D-03	0.498115972D-03
0.80D 06	0.499540484D-05	0.19981 691OD-04	0.124814822D-03	0.498069003D-03
0.90D 06	0.499489994D-05	0.19979671 1D-04	0.124801929D-03	0.498019019D-03
0.10D 07	0.499440206D-05	0.199776868D-04	0.124789526D-03	0.497970667D-03
0.20D 07	0.498940846D-05	0.1995769240-04	0.124664735D-03	0.497474485D-03
0.30D 07	0.498441229D-05	0.199377204D-04	0.124540022D-03	0.496977912D-03
0.40D 07	0.497942351D-05	0.199177799D-04	0.124415484D-03	0.496481979D-03
0.50D 07	0.497444645D-05	0.198978525D-04	0.124291139D-03	0.495986900D-03
0.60D 07	0.496947023D-05	0.1987795110-04	0.124166875D-03	0.495492065D-03
0.70D 07	0.496449614D-05	0.198580637D-04	0.124042731D-03	0.494998007D-03
0.80D 07	0.495952937D-05	0.198382036D-04	0.123918709D-03	0.494504262D-03
0.90D 07	0.495456793D-05	0.198183545D-04	0.1237948050-03	0.494010971D-03
0.10D 08	0.494961034D-05	0.197985233D-04	0.123671041D-03	0.49351 8186D-03
0.20D Oa	0.490031305D-05	0.19601 3465D-04	0.1224400970-03	0.488617820D-03
0.30D Oa	0.485150703D-05	0.194061348D-04	0.121221423D-03	0.483766017D-03
0.40D 08	0.480318626D-05	0.1921 28673D-04	0.120014866D-03	0.478962327D-03
0.50D 08	0.475534569D-05	0.190215211D-04	0.118820311D-03	0.474206400D-03
0.60D 08	0.470798381D-05	0.188320841D-04	0.117637658D-03	0.469497695D-03
0.70D 08	0.466109330D-05	0.186445327D-04	0.1164667840-03	0.4648358390-03
0.80D 08	0.461466917D-05	0.184588465D-04	0.1153075420-03	0.460220065D-03
0.90D 08	0.456870694D-05	0.182750082D-04	0.114159837D-03	0.455650247D-03
0.10D 09	0.452320331D-05	0.180930044D-04	0.113023572D-03	0.451125804D-03
0.200 09	0.409236213D-05	0.163697403D-04	0.102264725D-03	0.408280145D-03
0.300 09	0.370255880D-05	0.148106046D-04	0.925300115D-04	0.369503612D-03
0.40D 09	0.334988441D-05	0.1339996900-04	0.837219437D-04	0.334409931D-03
0.50D 09	0.303080338D-05	0.1 212368940-04	0.757523304D-04	0.302649340D-03
0.600 09	0.274211601D-05	0.109689744D-04	0.685413925D-04	0.273905256D-03
0.70D 09	0.248092493D-05	0.992423364D-05	0.6201685040-04	0.247890993D-03
0.80D 09	0.224461251D-05	0.8978999000-05	0.561133604D-04	0.224347474D-03
0.90D 09	0.203081051D-05	0.812379375D-05	0.507718555D-04	0.203040069D-03
0.10D 10	0.183737233D-05	0.7350041860-05	0.459387944D-04	0.183756253D-03
0.20D 10		0.270150182D-05	0.168947803D-04	0.677411562D-04
0.30D 10			0.621 344511D-05	0.249729249D-04
0.40D 10			0.2284124050-05	0.920239183D-05
0.50D 10			0.838725349D-06	0.338720710D-05
0.600 10			0.308056792D-06	0.124704277D-05
0.700 10			0.114062213D-06	0.6627071 22D-06
0.80D 10			0.434472006D-07	0.17651 3691D-06
0.900 10			0.1762638468-07	0.716632280D-07

t_D	2,000	5,000	10,000	∞
0.10 D-01	0.5339159240 00	0.5339159240 00	0.5339159240 00	0.5339159240 00
0.20 D-01	0.4611390790 00	0.4611390790 00	0.4611390790 00	0.4611390790D 00
0.30 0-01	0.4261015890 00	0.4261015890 00	0.4261015890D 00	0.4261015890 00
0.40 0-01	0.4039759570 00	0.4039759570D 00	0.4039759570D 00	0.4039759570 00
0.50 D-01	0.3881808850D 00	0.3881808850 00	0.3881808850D 00	0.3831808850 00
0.60 D-01	0.3760764170 00	0.3760784170 00	0.3760784170 00	0.3760784170 00
0.70 D-01	0.3663668650D 00	0.3663668650D 00	0.3663668650 00	0.3663668650 00
0.80 D-01	0.3583156060 00	0.3583156060 00	0.3583156060 00	0.3583156060 00
0.90 0-01	0.3514774850 00	0.3514774850 00	0.3514774850 00	0.3514774850 00
0.100 00	0.3455600000 00	0.3455600000 00	0.3455600000D 00	0.3455600000 00
0.200 00	0.31 07975950 00	0.3107975950 00	0.3107975950 00	0.3107975950 00
0.300 00	0.2933388570D 00	0.2933388570D 00	0.2933388570 00	0.2933388570 00
0.400 00	0.2820318160D 00	0.282031 8160 00	0.2820318160 00	0.2820318160 00
0.50D 00	0.2738137990D 00	0.27381 37990 00	0.27381 37990 00	0.2738137990 00
0.600 00	0.2674291720D 00	0.2674291720 00	0.2674291720 00	0.2674291720 00
0.700 00	0.2622479850D 00	0.2622479850 00	0.2622479850 00	0.2622479850 00
0.800 00	0.2579121330D 00	0.25791 2133D 00	0.2579121330D 00	0.2579121330 00
0.900 00	0.2541997720D 00	0.2541 997720 00	0.2541 997720 00	0.2541997720 00
0.10D 01	0.2509644810D 00	0.2509644810 00	0.2509644810 00	0.2509644810 00
0.20D 01	0.2315054460D 00	0.2315054460 00	0.2315054460 00	0.2315054463 00
0.300 01	0.2214167020D 00	0.2214167020 00	0.2214167020D 00	0.2214167020D 00
0.403 01	0.2147601660D 00	0.2147601660D 00	0.2147601660 00	0.2147601660 00
0.50D 01	0.2098585120D 00	0.2098585120D 00	0.2098585120D 00	0.20935~5120 00
0.600 01	0.2060121770D 00	0.2060121770 00	0.2060121770 00	0.2060121770D 00
0.70D 01	0.2028655670D 00	0.2028655670D 00	0.2028655670 00	0.2028655670D 00
0.800 01	0.2002146050D 00	0.2002146050D 00	0.2002146050 00	0.2002146050 00
0.900 01	0.1979316760D 00	0.1979316760 00	0.1 979316760 00	0.1979316760 00
0.100 02	0.1959321670D 00	0.1959321670 00	0.1959321670D 00	0.1959321670 00
0.200 02	0.1837020690D 00	0.1837020690D 00	0.1837020690D 00	0.1837020690D 00
0.30D 02	0.1772174970D 00	0.1772174970 00	0.1772174970 00	0.1772174970 00
0.400 02	0.1728825970D 00	0.1728825970D 00	0.1728825970D 00	0.1728825970D 00
0.500 02	0.1696610350D 00	0.1696610350 00	0.169661 0350 00	0.1696610350 00
0.600 02	0.1671151700D 00	0.1671151700 00	0.1671151700 00	0.1671151700D 00
0.703 02	0.1650206090D 00	0.1650206090 00	0.1650206090 00	0.1650206090D 00
0.800 02	0.1632475540D 00	0.1632475540D 00	0.1632475540D 00	0.1632475540 00
0.90D 02	0.1617144470D 00	0.1617144470D 00	0.1617144470 00	0.1617144470 00
0.10D 03	0.1603668930D 00	0.1603668930 00	0.1603668930D 00	0.1603668930 00
0.200 03	0.1520256480D 00	0.1520256480 00	0.1520256480D 00	0.1520256480 00
0.300 03	0.1475322680D 00	0.1475322680 00	0.1475322680D 00	0.1475322680 00
0.400 03	0.1445003930D 00	0.1445003930D 00	0.1445003930 00	0.1445003930 00
0.500 03	0.1422324550D 00	0.1422324550 00	0.1422324550 00	0.1422324550D 00
0.600 03	0.1404312010D 00	0.1404312010D 00	0.1404312010 00	0.1404312010 00
0.700 03	0.1389432580D 00	0.1389432580D 00	0.1389432550 00	0.1389432580 00
0.600 03	0.1376795020D 00	0.1376795020 00	0.1376795020D 00	0.1376795020D 00
0.900 03	0.1365836380D 00	0.1365836380 00	0.1365836380 00	0.1365836380D 00
0.10D 04	0.1356179820D 00	0.1356 179820 00	0.1356179320 00	0.1356179820D 00
0.200 04	0.1254336850D 00	0.1295906080D 00	0.1295906080D 00	0.1295906050 00
0.300 04	0.1166513740D 00	0.1263084870 00	0.1263084870 00	0.1263084870D 00
0.400 04	0.1084974130D 00	0.1240804990 00	0.1240804980 00	0.1240804980 00
0.50D 04	0.1009235660D 00	0.1224071810 00	0.1224071810 00	0.1224071810 00
0.600 04	0.9388827180D-01	0.1210743390 00	0.1210743390 00	0.1210743390D 00
0.700 04	0.8735316860D-01	0.1199709470 00	0.1 199709470D 00	0.1 199709470 00
0.80D 04	0.8128269320D-01	0.1181516340 00	0.1190321950D 00	0.11 90321950 00
0.900 04	0.7564380160D-01	0.1169191780 00	0.1182170920D 00	0.1182170920 00
0.10D 05	0.7040580840D-01	0.1157177450 00	0.11 74980930 00	0.1174980930D 00
0.203 05	0.3470365860D-01	0.1045764720 00	0.1130001330D 00	0.1130001330 00
0.30D 05	0.1762800440D-01	0.9464093470-01	0.1105516850D 00	0.1105516650 00
0.400 05	0.9460750270D-02	0.8576505100-01	0.1074373630 00	0.1088959210D 00
0.500 05	0.5553585430D-02	0.7783546710-01	0.1050360130 00	0.1076588970 00
0.60D 05	0.3684237210D-02	0.7075132150-01	0.1027247390 00	0.1066795910 00
0.700 05	0.2790302360D-02	0.6442247650-01	0.100491 7850 00	0.1058742400 00
0.800 05	0.2363439190D-02	0.5876842120-01	0.9833298590D-01	0.1051938520 00
0.900 05	0.2160099380D-02	0.5371720200D-01	0.9624557250D-01	~0.1046073690 00
0.100 06	0.2063525070D-02	0.4920456100-01	0.9422717330D-01	0.1040939070D 00
0.200 06	0.1971841790D-02	0.2363883350-01	0.7737024840-01	0.1010025020D 00
0.300 06	0.1971449150D-02	0.1535814660-01	0.6532238130D-01	0.9945736520-01
0.400 06	0.1972301220D-02	0.1267462940-01	0.5671148340D-01	0.9849925200D-01
0.500 06	0.1972380480D-02	0.1180530540-01	0.5055691240-01	0.9784337480D-01
0.60D 06	0.1972137630D-02	0.1152436540D-01	0.4615781910D-01	0.9736781580D-01
0.700 06	0.1971838010D-02	0.1143363640-01	0.4301323180-01	0.9700971800D-01
0.800 06	0.1971563240D-02	0.1140378330-01	0.4076518120-01	0.9673275950-01

t_D	2,000	5,000	10,000	∞
0.900 06	0.1971310490-02	0.1139309080D-01	0.3915776220-01	0.9651423010D-01
0.100 07	0.1971085400D-02	0.1138835380-01	0.3800813360D-01	0.9633910300D-01
0.200 07	0.1969114300D-02	0.1137434140D-01	0.3521062100-01	0.9562745010D-01
0.300 07	0.1967180300D-02	0.1136493250-01	0.3509099070-01	0.9548176630D-01
0.400 07	0.1965241560-02	0.1135455890-01	0.3506148590D-01	0.9544188860D-01
0.500 07	0.1963302720D-02	0.1134408380D-01	0.3503588970-01	0.9542755840D-01
0.600 07	0.1961 36480D-02	0.1133366660-01	0.3501 13123D-01	0.9542014310D-01
0.700 07	0.1959429450-02	0.1132329590D-01	0.3498702730-01	0.9541471530D-01
0.800 07	0.1957495150D-02	0.1131295680D-01	0.3496270880-01	0.9540990010D-01
0.900 07	0.1955562850D-02	0.1 130263450D-01	0.3493829590D-01	0.9540526140D-01
0.100 08	0.1953633520-02	0.1129232740-01	0.3491 38098D-01	0.9540069170D-01
0.200 08	0.1934436580D-02	0.1118977520-01	0.3466881320-01	0.9535545790D-01
0.300 08	0.1915428620-02	0.1108814140-01	0.3442563350D-01	0.9531048960D-01
0.400 08	0.1896607310-02	0.1098742830D-01	0.3418420180-01	0.9526576140D-01
0.500 08	0.1877970830D-02	0.1088763020-01	0.3394446020D-01	0.9522127200D-01
0.600 08	0.1859517440-02	0.1078873810-01	0.3370640780-01	0.9517702340D-01
0.730 08	0.1841245720-02	0.1069074650D-01	0.3347001680-01	0.9513302500D-01
0.800 08	0.1823153140-02	0.1059364090D-01	0.3323528380D-01	0.9508925300D-01
0.900 08	0.1805238790-02	0.1049741880-01	0.3300219880-01	0.9504572450D-01
0.100 09	0.1787500160-02	0.1040206980-01	0.3277075080-01	0.9500243180D-01
0.200 09	0.1619425210-02	0.9494954730-02	0.3054373830D-01	0.9458203760D-01
0.300 09	0.1467153180D-02	0.8666945430-02	0.2846812270D-01	0.9418339050D-01
0.400 09	0.13291 9906D-02	0.7911143540-02	0.2653362590-01	0.9380507460D-01
0.500 09	0.1204216870-02	0.7221252920-02	0.2473063750-01	0.9344573490-01
0.600 09	0.1090986900-02	0.6591527260-02	0.2305022100-01	0.9310413100-01
0.700 09'	0.9884032170D-03	0.6016717030-02	0.2148401930-01	0.927791 1200-01
0.800 09	0.8954650850-03	0.5492031 790D-02	0.2002428640-01	0.9246961720-01
0.900 09	0.81 12662170D-03	0.50131 0452D-02	0.18663771 9D-01	0.9217465460-01
0.100 10	0.7349838890-03	0.4575940750-02	0.1739572500-01	0.9189330310D-01
0.200 10	0.2737974790D-03	0.1837490770D-02	0.8608269830-02	0.8966776270D-01
0.300 10	0.1019976030-03	0.7378881970-03	0.4260469780D-02	0.8815744160-01
0.400 10	0.3798165570-04	0.2962619580-03	0.2 10887767D-02	0.8705842720-01
0.500 10	0.1412843520-04	0.1188537200-03	0.1043800480-02	0.8621204220-01
0.600 10	0.5255571440D-05	0.4764793860D-04	0.51 64432350D-03	0.8553083120-01
0.700 10	0.196851 749D-05	0.191441 925D-04	0.2553828440-03	0.8496379460-01
0.800 10	0.7561640070D-06	0.7781305450-05	0.1262721490-03	0.8447951430-01
0.300 10	0.3077534370D-06	0.3261 46808D-05	0.6254718520D-04	0.8405763360-01
0.100 11	0.1368518930-06	0.1451288280D-05	0.3117080700D-04	0.8368433190D-01

q_D FOR DIFFERENT VALUES OF r_{eD} (ω = 0.01, $\lambda = 10^{-5}$)

t_D	r_{eD} = 10	20	50	100	200
0.100-01	0.983780 00	0.983780 00	0.983780 00	0.983780 00	0.983780 00
0.200-01	0.800590 00	0.800590 00	0.800590 00	0.800590 00	0.800590 00
0.300-01	0.716210 00	0.716210 00	0.716210 00	0.716210 00	0.716210 00
0.400-0 1	0.664410 00	0.664410 00	0.664410 00	0.664410 00	0.664410 00
0.500-01	0.628190 00	0.628190 00	0.628190 00	0.628190 00	0.628190 00
0.600-01	0.600900 00	0.600900 00	0.600900 00	0.600900 00	0.600900 00
0.700-01	0.579290 00	0.579290 00	0.579290 00	0.579290 00	0.579290 00
0.800-0 1	0.561590 00	0.561599 00	0.561590 00	0.561590 00	0.561590 00
0.900-0 1	0.546700 00	0.546700 00	0.546700 00	0.546700 00	0.546700 00
0.100 00	0.533940 00	0.533940 00	0.533940 00	0.533940 00	0.533940 00
0.200 00	0.461170 00	0.461170 00	0.461170 00	0.461170 00	0.461170 00
0.300 00	0.426140 00	0.426140 00	0.426140 00	0.426140 00	0.426140 00
0.400 00	0.354730 00	0.404020 00	0.404020 00	0.404020 00	0.404020 00
0.500 00	0.314130 00	0.388240 00	0.388240 00	0.388240 00	0.368240 00
0.600 00	0.278190 00	0.376140 00	0.376140 00	0.376140 00	0.376140 00
0.700 00	0.246370 00	0.366430 00	0.366430 00	0.366430 00	0.366430 00
0.800 00	0.218200 00	0.353390 00	0.358390 CO	0.358390 00	0.353390 00
0.900 00	0.193250 00	0.351560 00	0.351560 00	0.351560 00	0.351560 00
0.100 01	0.171170 00	0.345640 00	0.345640 00	0.345640 00	0.345640 00
0.200 01	0.510390-01	0.273009 00	0.310930 00	0.310930 00	0.310930 00
0.300 01	0.154600-01	0.220060 00	0.293520 00	0.293520 00	0.293520 00
0.400 01	0.491970-02	0.177470 00	0.282250 00	0.282250 00	0.282250 00
0.500 01	0.180310-02	0.143200 00	0.274070 00	0.274070 00	0.274070 00
0.600 01	0.887060-03	0.115620 00	0.267720 00	0.267720 00	0.267720 00
0.700 01	0.6 19130-03	0.934220-01	0.262570 00	0.262570 00	0.262570 00
0.800 01	0.539150-03	0.755640-01	0.252050 00	0.258270 00	0.258270 00
0.900 01	0.512650-03	0.61 1930-01	0.245820 00	0.254580 00	0.254580 00
0.100 02	0.501490-03	0.496290-01	0.239790 00	0.251380 00	0.251380 00
0.200 02	0.492180-03	0.740480-02	0.187740 00	0.232200 00	0.232200 00
0.300 02	0.495760-03	0.2601 90-02	0.147600 00	0.222350 00	0.222350 00
0.400 02	0.495310-03	0.206290-02	0.11664D 00	0.208450 00	0.215920 00
0.500 02	0.494700-03	0.199920-02	0.92741 D-01	0.198510 00	0.211240 00
0.600 02	0.494380-03	0.198670-02	0.743040-01	0.189190 00	0.207600 00
0.700 02	0.494210-03	0.198190-02	0.600770-01	0.180420 00	0.204650 00
0.800 02	0.4941 3D-03	0.198020-02	0.491000-01	0.172180 00	0.202190 00
0.900 02	0.494080-03	0.198030-02	0.406300-01	0.164420 00	0.200090 00
0.100 03	0.494040-03	0.1981 1D-02	0.340940-01	0.157130 00	0.198270 00
0.200 03	0.493610-03	0.1 98310-02	0.136530-01	0.104290 00	0.179480 00
0.300 03	0.493120-03	0.198040-02	0.121210-01	0.756660-01	0.165420 00
0.400 03	0.492630-03	0.197820-02	0.11 9960-01	0.601580-01	0.154010 00
0.500 03	0.492130-03	0.197620-02	0.119720-01	0.517470-01	0.144750 00
0.600 03	0.491630-03	0.197420-02	0.1 1957D-01	0.471 770-01	0.137230 00
0.700 03	0.491 14D-03	0.197231)-02	0.119440-01	0.446860-01	0.131120 00
0.800 03	0.490640-03	0.197030-02	0.119330-01	0.433220-01	0.126160 00
0.900 03	0.490150-03	0.196830-02	0.119220-01	0.425680-01	0.122120 00
0.100 04	0.489650-03	0.196630-02	0.11 912D-01	0.421450-01	0.118840 00
0.200 04	0.484730-03	0.194670-02	0.11 7980-01	0.413360-01	0.106140 00
0.300 04	0.479870-03	0.192720-02	0.116830-01	0.409840-01	0.104100 00
0.400 04	0.475050-03	0.190790-02	0.115700-01	0.406400-01	0.103370 00
0.500 04	0.470280-03	0.188880-02	0.114580-01	0.402980-01	0.102790 00
0.600 04	0.465550-03	0.186990-02	0.113480-01	0.3995 90-01	0.102250 00
0.700 04	0.460880-03	0.185120-02	0.112380-01	0.396210-01	0.101700 00
0.800 04	0.456250-03	0.183270-02	0.111290-01	0.392870-01	0.101160 00
0.900 04	0.451670-03	0.181440-02	0.110220-01	0.389550-01	0.100620 00
0.100 05	0.447130-03	0.179620-02	0.109150-01	0.386270-01	0.100090 00
0.200 05	0.404210-03	0.162440-02	0.990420-02	0.354890-01	0.949080-01
0.300 05	0.365400-03	0.146900-02	0.898710-02	0.326070-01	0.899950-01
0.400 05	0.330320-03	0.132840-02	0.81 5490-02	0.299590-01	0.853380-01
0.500 05	0.296610-03	0.120140-02	0.739980-02	0.275250-01	0.809250-01
0.600 05	0.269940-03	0.108640-02	0.671460-02	0.252900-01	0.76 7410-01
0.705 05	0.244030-03	0.982490-03	0.609290-02	0.232360-01	0.727750-01
0.800 05	0.220600-03	0.688500-03	0.552870-02	0.2 13490-01	0.6901 60-01
0.900 05	0.199420-03	0.803500-03	0.501670-02	0.196 160-01	0.654520-01
0.100 06	0.180270-03	0.726630-03	0.455220-02	0.180230-01	0.620740-01
0.200 06	0.657060-04	0.265830-03	0.172280-02	0.772810-02	0.365700-01
0.300 06	0.239490-04	0.972540-04	0.652030-03	0.331470-02	0.215700-01
0.400 06	0.872470-05	0.355640-04	0.246690-03	0.142180-02	0.127320-01
0.500 06	0.31 7490-05	0.129900-04	0.932400-04	0.609660-03	0.75 1930-02
0.600 06	0.115580-05	0.47467D-05	0.352340-04	0.261230-03	0.444 170-02
0.700 06	0.424540-06	0.174920-05	0.133890-04	0.111980-03	0.262390-02
0.800 06	0.160830-06	0.664120-06	0.519920-05	0.482400-04	0.154980-02
0.900 06	0.651410-07	0.269210-06	0.212480-05	0.211060-04	0.915090-03
0.100 07	0.290500-07	0.120040-06	0.944780-06	0.956180-05	0.540250-03

t_D	500	1,000	2,000	4,000	10,000
0.10D-01	0.983780D 00	0.983780 00	0.983780 00	0.983780 00	0.983780D 00
0.20D-01	0.800590D 00	0.800590 00	0.800590 00	0.800590 00	0.800590D 00
0.30D-01	0.716210D 00	0.716210 00	0.716210 00	0.716210 00	0.716210D 00
0.40D-01	0.664410D 00	0.664410 00	0.664410 00	0.664410 00	0.664410D 00
0.500-01	0.628190D 00	0.628190 00	0.628190D 00	0.628190 00	0.628190D 00
0.60D-01	0.600900D 00	0.600900D 00	0.600900 00	0.600900 00	0.600900 00
0.70D-01	0.579290D 00	0.579290 00	0.579290 00	0.579290 00	0.579290D 00
0.80D-01	0.561590D 00	0.561590 00	0.561590 00	0.561590 00	0.561590 00
0.90D-01	0.546700D 00	0.546700 00	0.546700 00	0.546700 00	0.546700 00
0.10D 00	0.533940D 00	0.533940 00	0.533940 00	0.533940 00	0.533940D 00
0.200 00	0.461170D 00	0.461170 00	0.461170 00	0.461170 00	0.461170D 00
0.30D 00	0.426140D 00	0.426140 00	0.426140 00	0.426140 00	0.426140 00
0.400 00	0.404020D 00	0.404020 00	0.404020 00	0.404020D 00	0.404020 00
0.500 00	0.388240D 00	0.388240 00	0.388240 00	0.388240D 00	0.388240D 00
0.600 00	0.376140D 00	0.376140 00	0.376140 00	0.376140 00	0.376140 00
0.700 00	0.366430D 00	0.366430 00	0.366430 00	0.366430 00	0.366430 00
0.80D 00	0.358390D 00	0.358390 00	0.358390D 00	0.358390 00	0.358390 00
0.90D 00	0.351560D 00	0.351560 00	0.351560 00	0.351560 00	0.351560 00
0.10D 01	0.345640D 00	0.345640 00	0.345640 00	0.345640 00	0.345640 00
0.20D 01	0.310930D 00	0.310930 00	0.310930 00	0.310930 00	0.310930 00
0.300 01	0.293520D 00	0.293520 00	0.293520 00	0.293520D 00	0.293520 00
0.400 01	0.282250D 00	0.282250 00	0.282250 00	0.282250 00	0.282250 00
0.500 01	0.274070D 00	0.274070 00	0.274070D 00	0.274070D 00	0.274070 00
0.600 01	0.267720D 00	0.267721) 00	0.267720 00	0.267720D 00	0.267720 00
0.700 01	0.262570D 00	0.262570 00	0.262570 00	0.262570D 00	0.262570 00
0.800 01	0.258270D 00	0.258270 00	0.258270D 00	0.258270 00	0.258270D 00
0.900 01	0.254580D 00	0.254580 00	0.254580 00	0.254580 00	0.254580 00
0.10D 02	0.251380D 00	0.251380 00	0.251380 00	0.251380 00	0.251380 00
0.200 02	0.232200D 00	0.232200 00	0.232200 00	0.232200 00	0.232200 00
0.30D 02	0.222350D 00	0.222350 00	0.222350 00	0.222350 00	0.222350 00
0.400 02	0.215920D 00	0.215920 00	0.215920 00	0.215920 00	0.215920 00
0.500 02	0.211240D 00	0.211240 00	0.211240 00	0.211240 00	0.211240 00
0.600 02	0.207600D 00	0.207600 00	0.207600 00	0.207600. 00	0.207600 00
0.700 02	0.204650D 00	0.204550 00	0.204650 00	0.204650 00	0.204650 00
0.800 02	0.202190D 00	0.202190 00	0.202190 00	0.202190 00	0.202190 00
0.90D 02	0.200090D 00	0.200090 00	0.200090 00	0.200090 00	0.200090 00
0.10D 03	0.198270D 00	0.198270 00	0.198270D 00	0.198270 00	0.198270 00
0.200 03	0.187660D 00	0.187660D 00	0.187660D 00	0.187660 00	0.187660 00
0.300 03	0.182590D 00	0.182590 00	0.182590 00	0.182590 00	0.182590 00
0.400 03	0.179520D 00	0.179520 00	0.179520 00	0.179520 00	0.179520 00
0.500 03	0.177450D 00	0.177450 00	0.177450 00	0.177450 00	0.177450 00
0.600 03	0.175970D 00	0.175970 00	0.175970D 00	0.175970 00	0.175970D 00
0.700 03	0.174870D 00	0.174870 00	0.174870 00	0.174870D 00	0.174870D 00
0.800 03	0.173020D 00	0.174020 00	0.174020 00	0.174020 00	0.174020 00
0.90D 03	0.171990D 00	0.173350 00	0.173350 00	0.173350D 00	0.173350D 00
0.10D 04	0.171080D 00	0.172820 00	0.172820 00	0.172820 00	0.172820 00
0.200 04	0.165920D 00	0.170630 00	0.170630 00	0.170630D 00	0.170630 00
0.300 04	0.164120D 00	0.170100 00	0.170100 00	0.170100 00	0.170100 00
0.400 04	0.163380D 00	0.169690 00	0.169860 00	0.169860D 00	0.169860 00
0.500 *04*	0.162980D 00	0.169490D 00	0.169690 00	0.169690 00	0.169690 00
0.600 04	0.162680D 00	0.169320 00	0.169540 00	0.169540 00	0.160540 00
0.700 04	0.162420D 00	0.169170D 00	0.169400 00	0.169400 00	0.169400 00
0.800 04	0.162160D 00	0.169020 00	0.169260 00	0.169260 00	0.169260 00
0.900 04	0.161910D 00	0.168870D 00	0.169120 00	0.169120 00	0.169120 00
0.100 05	0.161670D 00	0.168730 00	0.168980 00	0.168930 00	0.168980D 00
0.200 05	0.159230D 00	0.167310 00	0.167640 00	0.167640 00	0.167640D 00
0.300 05	0.156860D 00	0.165970D 00	0.166370D 00	0.166370 00	0.166370 00
0.400 05	0.154550D 00	0.164690D 00	0.165170D 00	0.165170D 00	0.165170 00
0.500 05	0.152330D 00	0.163470 00	0.164040 00	0.164040 00	0.164040 00
0.600 05	0.150100D 00	0.162300 00	0.162970D 00	0.162970 00	0.162970D 00
0.700 05	0.147960D 00	0.161190D 00	0.161950 00	0.161950 00	0.161950 00
0.800 05	0.145860D 00	0.160120 00	0.160980 00	0.160990D 00	0.160990 00
0.90D 05	0.143810D 00	0.159100 00	0.160070 00	0.160070 00	0.160070 00
0.100 06	0.141800D 00	0.158120 00	0.159200 00	0.159200 00	0.159200 00
0.200 06	0.123740D 00	0.150000 00	0.152440D 00	0.152460D 00	0.152460 00
0.300 06	0.108500D 00	0.143800 00	0.147990 00	0.148040 00	0.148040D 00
0.400 06	0.953400D-01	0.138590 00	0.144810 00	0.144910 00	0.144910 00
0.500 06	0.838600D-01	0.133930 00	0.142370 00	0.142550 00	0.142550 00
0.600 06	0.737970D-01	0.129610 00	0.140390 00	0.140680D 00	0.140680 00
0.700 06	0.649540D-01	0.125510 00	0.138720D 00	0.139140 00	0.139140 00
0.800 06	0.571770D-01	0.121580 00	0.137250 00	0.137840 00	0.137840 00
0.900 06	0.503330D-01	0.117800 00	0.135920 00	0.136720 00	0.136720D 00
0.10D 07	0.443090D-01	0.114150 00	0.134690D 00	0.135740 00	0.135740 00

t_D	500	1,000	2,000	4,000	10,000
0.200 07	0.12387D-01	0.83412D-01	0.124680 00	0.129600 00	0.129630 00
0.300 07	0.346210-02	0.60959D-01	0.115960 00	0.126150 00	0.126310 00
0.400 07	0.966080-03	0.445500-01	0.107880 00	0.12358D 00	0,124070 00
0.500 07	0.270010-03	0.32559D-01	0.100360 00	0.121360 00	0.122380 00
0.600 07	0.772770-04	0.237950-01	0.93364D-01	0.119290 00	0.121040 00
0.700 07	0.239940-04	0.173900-01	0.868570-01	0.117310 00	0.119930 00
0.800 07	0.86221D-05	0.127090-01	0.808040-01	0.115390 00	0.118960 00
0.900 07	0.339090-05	0.92882D-02	0.751730-01	0.113490 00	0.11815D 00
0.100 08	0.100080-05	0.678790-02	0.699340-01	0.111630 00	0.117430 00
0.200 08		0.29421 0-03	0.339590-01	0.94648D-01	0.112750 00
0.300 08		0.15702D-04	0.16491 D-01	0.80252D-01	0.109740 00
0.400 08		0.12810D-05	0.800790-02	0.680450-01	0.107110 00
0.500 08			0.38880D-02	0.576950-01	0.104600 00
0.600 08			0.188670-02	0.489200-01	0.10215D 00
0.700 08			0.9 15040 -03	0.414790-01	0.99773D-01
0.800 08			0.443820-03	0.351 700-01	0.974470-0 1
0.900 08			0.215820-03	0.29820D-01	0.951 76D-01
0.10D 09			0.105810-03	0.252840-01	0.929570-01
0.200 09				0.48560D-02	0.73426D-01
0.300 09				0.93094D-03	0.579990-01
0.400 09				0.17893D-03	0.456130-01
0.500 09				0.36369D-04	0.36 1870-01
0.600 09				0.896410-05	0.28584D-01
0.700 09				0.265240-05	0.225790-01
0.800 09				0.367940-06	0.178350-01
0.900 09					0.14088D-01
0.100 10					0.111280-01
0.200 10					0.105080-02
0.300 10					0.99973D-04
0.400 10					0.115850-04
0.500 10					0.196100-05

$r_{eD} = \infty$

t_D	q_D	t_D	q_D	t_D	q_D
0.100-01	0.983780 00	0.300 03	0.18259D 00	0.500 07	0.122380 00
0.20D-01	0.800590 00	0.400 03	0.179520 00	0.60D a7	0.121040 00
0.300-01	0.716210 00	0.500 03	0.177450 00	0.700 07	0.119930 00
0.400-01	0.664410 00	0.600 03	0.17597D 00	0.800 07	0.118960 00
0.500-01	0.628190 00	0.700 03	0.174870 00	0.900 07	0.118150 00
0.600-01	0.600900 00	0.800 03	0.174020 00	0.100 08	0.117430 00
0.700-01	0.579290 00	0.900 03	0.173350 00	0.200 08	0.112860 00
0.80D-01	0.561590 00	0.100 04	0.172820 00	0.300 08	0.110350 00
0.90D-01	0.546700 00	0.200 04	0.170630 00	0.400 08	0.108630 00
0.100 00	0.533940 00	0.300 04	0.170100 00	0.500 08	0.107340 00
0.200 00	0.4611713 00	0.40D 04	0.169860 00	0.600 08	0.106310 00
0.300 00	0.426140 00	0.50D 04	0.169690 00	0.700 08	0.10545D 00
0.400 00	0.404020 00	0.600 04	0.169540 00	0.800 08	0.104710 00
0.500 00	0.38824D 00	0.700 04	0.169400 00	0.90D 08	0.104070 00
0.600 00	0.376140 00	0.80D 04	0.169260 00	0.100 09	0.103510 00
0.700 00	0.366430 00	0.900 04	0.169120 00	0.200 09	0.99942D-01
0.80D 00	0.358390 00	0.10D 05	0.168960 00	0.300 09	0.979660-01
0.900 00	0.351560 00	0.200 05	0.167640 00	0.400 09	0.966110-01
0.100 01	0.345640 00	0.30D 05	0.166370 00	0.500 09	0.955650-01
0.200 01	0.310930 00	0.400 05	0.165170 00	0.600 09	0.9476 3D-01
0.300 01	0.293520 00	0.500 05	0.164040 00	0.700 09	0.940790-01
0.400 01	0.282250 00	0.600 05	0.162970 00	0.80D 09	0.93494D-01
0.500 01	0.274070 00	0.700 05	0.161950 00	0.900 09	0.929640-01
0.600 01	0.267720 00	0.800 05	0.160990 00	0.100 10	0.92533D-01
0.70D 01	0.262570 00	0.900 05	0.160070 00	0.200 10	0.89668D-01
0.800 01	0.25827D 00	0.100 06	0.159200 00	0.300 10	0.883730-01
0.900 01	0.254580 00	0.200 06	0.152460 00	0.400 10	0.86975D-01
0.10D 02	0.251380 00	0.300 06	0.146040 00	0.500 10	0.86142D-01
0.200 02	0.232200 00	0.400 06	0.144910 00	0.600 10	0.854730-01
0.300 02	0.222350 00	0.50D 06	0.142550 00	0.70D 10	0.8491 6D-01
0.400 02	0.215920 00	0.600 06	0.140680 00	0.800 10	0.844390-01
0.50D 02	0.211240 00	0.700 06	0.139140 00	0.900 10	0.840220-01
0.600 02	0.207600 00	0.800 06	0.137840 00	0.100 11	0.836530-01
0.700 02	0.204650 00	0.900 06	0.136720 00		
0.800 02	0.202190 00	0.100 07	0.135740 00		
0.900 02	0.200090 00	0.200 07	0.129430 00		
0.100 03	0.196270 00	0.300 07	0.12631D 00		
0.200 03	0.187660 00	0.400 07	0.124070 00		

q_D FOR DIFFERENT VALUES OF r_{eD} (ω = 0.01, λ =

t_D	r_{eD} = 10	20	50	100	200
0.10D-01	0.98377D 00	0.98377D 00	0.98377D 00	0.983770 00	0.98377D 00
0.200-01	0.80058D 00	0.800580 00	0.800580 00	0.80058D 00	0.80058D 00
0.300-01	0.71620D 00	0.716200 00	0.716200 00	0.71620D 00	0.71620D 00
0.40D-01	0.66440D 00	0.664400 00	0.664400 00	0.664400 00	0.66440D 00
0.500-01	0.62818D 00	0.628180 00	0.62818D 00	0.62818D 00	0.62818D 00
0.600-01	0.60088D 00	0.600880 00	0.600880 00	0.60088D 00	0.60088D 00
0.70D-01	0.57928D 00	0.57928D 00	0.579280 00	0.57928D 00	0.57928D 00
0.800-01	0.56157D 00	0.561570 00	0.561570 00	0.561570 00	0.56157D 00
0.900-01	0.54669D 00	0.546690 00	0.546690 00	0.546690 00	0.54669D 00
0.100 00	0.53392D 00	0.533920 00	0.53392D 00	0.533920 00	0.53392D 00
0.20D 00	0.46114D 00	0.461140 00	0.461140 00	0.461140 00	0.46114D 00
0.300 00	0.42610D 00	0.426100 00	0.426100 00	0.426100 00	0.426100 00
0.400 00	0.35467D 00	0.403980 00	0.403980 00	0.40398D 00	0.40398D 00
0.500 00	0.31405D 00	0.38818D 00	0.38818D 00	0.388160 00	0.38818D 00
0.600 00	0.27809D 00	0.376080 00	0.376080 00	0.37608D 00	0.37608D 00
0.700 00	0.24625D 00	0.366370 00	0.366370 00	0.366370 00	0.36637D 00
0.80D 00	0.21806D 00	0.358320 00	0.35832D 00	0.358320 00	0.35832D 00
0.90D 00	0.19309D 00	0.35148D 00	0.351480 00	0.351480 00	0.551480 00
0.100 01	0.17099D 00	0.345560 00	0.345560 00	0.345560 00	0.345560 00
0.20D 01	0.50691D-01	0.27282D 00	0.310603 00	0.310800 00	0.31080D 00
0.300 01	0.15027D-01	0.219750 00	0.29334D 00	0.29334D 00	0.29334D 00
0.40D 01	0.44513D-02	0.177010 00	0.282030 00	0.282030 00	0.28203D 00
0.50D 01	0.13210D-02	0.142580 00	0.273820 00	0.273820 00	0.27382D 00
0.600 01	0.39999D-03	0.114850 00	0.267430 00	0.267430 00	0.267430 00
0.700 01	0.13040D-03	0.925130-01	0.262250 00	0.262250 00	0.262250 00
0.800 01	0.49860D-04	0.745220-01	0.251660 00	0.257920 00	0.257920 00
0.903 01	0.23146D-04	0.60030D-01	0.245360 00	0.254200 00	0.254200 00
0.10D 02	0.11942D-04	0.48358D-01	0.239290 00	0.250970 00	0.250970 00
0.200 02	0.25784D-05	0.557270-02	0.18647D 00	0.23151D 00	0.231510 00
0.300 02	0.62723D-05	0.657620-03	0.145340 00	0.221430 00	0.22143D 03
0.400 02	0.58469D-05	0.100550-03	0.113290 00	0.207070 00	0.214770 00
0.50D 02	0.52819D-05	0.34491 0-04	0.88310D-01	0.196680 00	0.20987D 00
0.600 02	0.50010D-05	0.218050-04	0.68846D-01	0.186830 00	0.206030 00
0.700 02	0.48945D-05	0.17082D-04	0.536770-01	0.177480 00	0.20288D 00
0.800 02	0.48597D-05	0.15549D-04	0.41857D-01	0.168610 00	0.200230 00
0.900 02	0.48544D-05	0.157690-04	0.326460-01	0.16017D 00	0.197950 00
0.10D 03	0.48685D-05	0.16794D-04	0.25468D-01	0.152160 00	0.195940 00
0.200 03	0.49443D-05	0.20828D-04	0.221390-02	0.911510-01	0.17427D 00
0.30D 03	0.49517D-05	0.201100-04	0.300350-03	0.546830-01	0.156300 00
0.400 03	0.49499D-05	0.19903D-04	0.14461D-03	0.328860-01	0.14020D 00
0.500 03	0.49514D-05	0.19883D-04	0.127620-03	0.19857D-01	0.12579D 00
0.600 03	0.49509D-05	0.19899D-04	0.122980-03	0.120700-01	0.11287D 00
0.700 03	0.49502D-05	0.19914D-04	0.1 2167D-03	0.741400-02	0.101310 00
0.800 03	0.49496D-05	0.19924D-04	0.12198D-03	0.46305D-02	0.90950D-01
0.90D 03	0.49497D-05	0.199310-04	0.12291 D-03	0.29667D-02	0.81670D-01
0.100 04	0.49498D-05	0.19936D-04	0.123850-03	0.197250-02	0.73359D-01
0.200 04	0.49490D-05	0. I9946D-04	0.125320-03	0.511750-03	0.257070-01
0.300 04	0.49483D-05	0.19944D-04	0.12488D-03	0.496890-03	0.98671D-02
0.400 04	0.49480D-05	0.199410-04	0.124800-03	0.49658D-03	0.46002D-02
0.50D 04	0.49474D-05	0.199390-04	0.12480D-03	0.49810D-03	0.28500D-02
0.600 04	0.49469D-05	0.19937D-04	0.124800-03	0.49899D-03	0.22703D-02
0.700 *04*	0.49465D-05	0.19935D-04	0.124800-03	0.49923D-03	0.20794D-02
0.803 04	0.49459D-05	0.199330-04	0.12479D-03	0.499170-03	0.201653-02
0.900 04	0.49455D-05	0.199310-04	0.12478D-03	0.499010-03	0.19950D-02
0.10D 05	0.49450D-05	0.199290-04	0.12477D-03	0.49883D-03	0.19867D-02
0.200 05	0.49400D-05	0.19909D-04	0.12465D-03	0.49796D-03	0.19768D-02
0.300 05	0.49350D-05	0.19889D-04	0.12452D-03	0.49748D-03	0.19767D-02
0.4CD 05	0.49300D-05	0.198690-04	0.124400-03	0.49699D-03	0.19748D-02
0.50D 05	0.49250D-05	0.198490-04	0.124270-03	0.496500-03	0.19726D-02
0.600 05	0.49201D-05	0.198290-04	0.12415D-03	0.49600D-03	0.19705D-02
0.70D 05	0.49151D-05	0.19809D-04	0.12402D-03	0.49550D-03	0.19684D-02
0.80D 05	0.49101D-05	0.197890-04	0.123900-03	0.49500D-03	0.19664D-02
0.90D 05	0.49052D-05	0.1 97690-04	0.12377D-03	0.49450D-03	0.19645D-02
0.10D 06	0.49002D-05	0.19749D-04	0.123650-03	0.494003-03	0.19625D-02
0.209 06	0.48510D-05	0.19550D-04	0.122400-03	0.489050-03	0.19430D-02
0.300 06	0.48022D-05	0.19354D-04	0.1 2117D-03	0.48414D-03	0.19236D-02
0.400 06	0.47540D-05	0.191 59D-04	0.11996D-03	0.47928D-03	0.19045D-02
0.500 06	0.47062D-05	0.18967D-04	0.118750-03	0.474450-03	0.18855D-02
0.600 06	0.46589D-05	0.18776D-04	0.11 756D-03	0.46972D-03	0.18667D-02

t_D	10	20	50	100	200
0.700 06	0.461210-05	0.18587D-04	0.116380-03	0.465010-03	0.18481 D-02
0.800 06	0.45657D-05	0.184010-04	0.115210-03	0.460340-03	0.1 8297D-02
0.900 06	0.451980-05	0.18216D-04	0.114050-03	0.455720-03	0.181150-02
0.100 07	0.44744D-05	0.180330-04	0.112910-03	0.45115D-03	0.17935D-02
0.20D 07	0.404450-05	0.163000-04	0.102060-03	0.40 7890-03	0.16226D-02
0.300 07	0.365590-05	0.14734D-04	0.92260D-04	0.369770-03	0.14681D-02
0.400 07	0.330470-05	0.1331 OD-04	0.83400D-04	0.333410-03	0.132820-02
0.500 07	0.296720-05	0.120390-04	0.753900-04	0.301430-03	0.12017D-02
0.600 07	0.270020-05	0.10882D-04	0.681500-04	0.27252D-03	0.10872D-02
0.70D 07	0.244060-05	0.983700-05	0.61605D-04	0.246390-03	0.98369D-03
0.800 07	0.220630-05	0.889190-05	0.556880-04	0.222760-03	0.88999D-03
0.900 07	0.199430-05	0.803760-05	0.50340D-04	0.201400-03	0.805210-03
0.100 08	0.18027D-05	0.72654D-05	0.455050-04	0.18208D-03	0.72851D-03
0.200 08	0.656530-06	0.264610-05	0.165790-04	0.664410-04	0.26774D-03
0.300 08	0.239100-06	0.96373D-06	0.604040-05	0.242440-04	0.984020-04
0.400 08	0.870390-07	0.350830-06	0.21997D-05	0.884270-05	0.36149D-04
0.500 08	0.31648D-07	0.127570-06	0.800140-06	0.322150-05	0.13265D-04
0.600 08	0.115120-07	0.46409D-07	0.29118D-06	0.11 741D-05	0.486890-05
0.700 08	0.422550-08	0.1 70340-07	0.106910-06	0.431 690-06	0.180160-05
0.800 08	0.159990-08	0.64491 0-08	0.404310-07	0.16368D-06	0.686010-06
0.000 08	0.648400-09	0.26133D-08	0.164000-07	0.66343D-07	0.27839D-06
0.100 09	0.28898D-09	0.116610-08	0.731360-08	0.295550-07	0.12405D-06

t_D	500	1,000	2,000	4,000	10,000
0.10D-01	0.98377D 00	0.98377D 00	0.983770 00	0.983770 00	0.983770 00
0.20D-01	0.800580 00	0.800580 00	0.800580 00	0.800550 00	0.80058D 00
0.300-01	0.716200 00	0.716201) 00	0.716200 00	0.716200 00	0.71620D CO
0.400-01	0.664400 00	0.664400 00	0.664400 00	0.66440D. 00	0.664400 00
0.500-01	0.628180 00	0.628180 00	0.628180 00	0.623160 00	0.628189 GO
0.60D-01	0.600880 00	0.600680 00	0.600880 00	0.600850 00	0.60088D 00
0.700-0 1	0.579260 00	0.579269 00	0.579280 00	0.579260 00	0.57928D 00
0.80D-01	0.561570 00	0.561570 00	0.561570 00	0.561570 00	0.561570 00
0.90D-01	0.546600 00	0.546690 00	0.546690 00	0.546691) 00	0.54669D 00
0.10D 00	0.533920 00	0.533920 00	0.533920 00	0.533920 00	0.53392D 03
0.200 00	0.461140 00	0.46114D 00	0.461140 00	0.461140 00	0.461140 00
0.300 00	0.426100 00	0.426100 00	0.426100 00	0.426100 00	0.426100 00
0.40D 00	0.403930 00	0.40398D 00	0.403900 00	0.403980 00	0.40398D 00
0.500 00	0.388180 00	0.38818D 00	0.388160 00	0.388180 00	0.388165 00
0.60D 00	0.376080 00	0.376080 00	0.37608D 00	0.376060 00	0.376080 00
0.70D 00	0.36637D 00	0.36637D 00	0.366370 00	0.366370 00	0.366370 00
0.800 00	0.353320 00	0.358320 00	0.358320 00	0.356320 00	0.355320 00
0.90D 00	0.351480 00	0.351480 00	0.351480 00	0.351480 00	0.351433 00
0.100 01	0.345560 00	0.345560 00	0.345560 00	0.345560 00	0.345560 00
0.20D 01	0.310800 00	0.310900 00	0.310800 00	0.31080D 00	0.31080D 00
0.300 01	0.293340 00	0.293340 00	0.29334D 00	0.293340 00	0.293340 00
0.400 01	0.282030 00	0.28203D 00	0.282030 00	0.282030 00	0.282033 00
0.500 01	0.273820 00	0.273820 00	0.273820 00	0.273820 00	0.273820 00
0.600 01	0.267430 00	0.267430 00	0.267430 00	0.267430 00	0.267430 00
0.700 01	0.262250 00	0.262250 00	0.262250 00	0.262250 00	0.262250 00
0.80D 01	0.257920 00	0.257920 00	0.257929 00	0.257920 00	0.257920 00
0.900 01	0.254200 00	0.25420D 00	0.254200 00	0.254200 00	0.254220 00
0.100 02	0.250970 00	0.250970 00	0.250970 00	0.250970 00	0.250970 00
0.200 02	0.231510 00	0.231510 00	0.231510 00	0.231510 00	0.231510 00
0.30D 02	0.221430 00	0.221430 00	0.221430 00	0.221430 00	0.221430 00
0.400 02	0.214770 00	0.214770 00	0.214770 00	0.214770 00	0.214770 00
0.50D 02	0.209870 00	0.209870 00	0.209870 00	0.209570 00	0.209870 00
0.60D 02	0.206030 00	0.206030 00	0.206030 00	0.206030 00	0.206030 00
0.70D 02	0.202680 00	0.202890 00	0.202850 00	0.202~30 00	0.20288D 00
0.80D 02	0.200230 00	0.200230 00	0.20023D 00	0.200230 00	0.20023D 00
0.900 02	0.197950 00	0.197950 00	0.197950 00	0.19795D 00	0.197950 00
0.100 03	0.195960 00	0.195960 00	0.195960 00	0.195960 00	0.195060 00
0.20D 03	0.18374D 00	0.183740 00	0.183740 00	0.183740 00	0.18374D 00
0.30D 03	0.177270 00	0.177270 00	0.177270 00	0.177270 00	0.1772733 00
0.400 03	0.172950 00	0.172950 00	0.172950 00	0.172950 00	0.172950 00
0.503 03	0.169750 00	0.169750 00	0.169750 00	0.169750 00	0.169750 00
0.600 03	0.167210 00	0.167210 00	0.167210 00	0.167210 00	0.167210 00
0.70D 03	0.165130 00	0.165130 00	0.165130 00	0.16513D 00	0.165130 00

t_D	500	1,000	2,000	4,000	10,000
0.80D 03	0.16151D 00	0.16337D 00	0.16337D 00	0.16337D 00	0.16337D C0
0.90D 03	0.15914D 00	0.161850 00	0.16185D 00	0.161850 00	0.161 85D 03
0.10D 04	0.15683D 00	0.16052D 00	0.16052D 00	0.160520 00	0.16052D 00
0.200 04	0.13588D 00	0.15229D 00	0.15229D 00	0.152290 00	0.15229D 00
0.30D 04	0.117963 00	0.147910 00	0.147910 00	0.147910 00	0.14791D 00
0.40D 04	0.10266D 00	0.14217D 00	0.144980 00	0.14498D 00	0.14498D 00
0.50D C4	0.89546D-01	0.137840 00	0.14281D 00	0.14281D 00	0.14281D 00
0.60D 04	0.783230-01	0.13370D 00	0.14110D 00	0.14110D 00	0.141 10D 00
0.70D 04	0.68719D-01	0.12974D 00	0.139710 00	0.13971D 00	0.139710 00
0.80D 04	0.60498D-01	0.12595D 00	0.13854D 00	0.138540 00	0.1 3854D 00
0.90D 04	0.534630-01	0.12231D 00	0.13753D 00	0.13753D 00	0.13753D 00
0.10D 05	0.47442D-01	0.11883D 00	0.13665D 00	0.13665D 00	0.13665D 00
0.20D 05	0.19227D-01	0.90998D-01	0.12783D 00	0.13142D 00	0.13142D 00
0.30D 05	0.13268D-01	0.72772D-01	0.12096D 00	0.128840 00	0.12884D 00
0.40D 05	0.12005D-01	0.608310-01	0.11518D 00	0.127260 00	0.12726D 00
0.50D 05	0.11 732D-01	0.53006D-01	0.11032D 00	0.12618D 00	0.126180 00
0.60D 05	0.11 667D-01	0.47873D-01	0.10622D 00	0.12441D 00	0.12540D 00
0.70D 05	0.116430-01	0.44503D-01	0.10278D 00	0.123370 00	0.12482D 00
0.80D 05	0.11628D-01	0.42286D-01	0.99869D-01	0.122460 00	0.12436D 00
0.90D 05	0.11615D-01	0.40825D-01	0.97420D-01	0.12164D 00	0.12401D 00
0.10D 06	0.11603D-01	0.398580-01	0.95355D-01	0.12091D 00	0.123720 00
0.20D 06	0.1 1496D-01	0.37818D-01	0.86168D-01	0.11680D 00	0.122530 00
0.30D 06	0.113860-01	0.37501D-01	0.84248D-01	0.11540D 00	0.122240 00
0.40D 06	0.11280D-01	0.372100-01	0.83615D-01	0.11485D 00	0.122030 00
0.50D 06	0.11174D-01	0.36924D-01	0.83210D-01	0.114550 00	0.12192D 00
0.60D 06	0.11069D-01	0.36641D-01	0.82846D-01	0.114340 00	0.121833 00
0.70D 06	0.10965D-01	0.36359D-01	0.82490D-01	0.11415D 00	0.12175D 00
0.80D 06	0.10862D-01	0.36080D-01	0.82137D-01	0.11397D 00	0.12168D 00
0.90D 06	0.10759D-01	0.35802D-01	0.81 786D-01	0.113790 00	0.12160D 00
0.10D 07	0.10658D-01	0.355270-01	0.81436D-01	0.113620 00	0.12153D 00
0.20D 07	0.96966D-02	0.32886D-01	0.78027D-01	0.111880 00	0.120793 00
0.30D 07	0.882180-02	0.30442D-01	0.74761D-01	0.11018D 00	0.12009D 00
0.400 07	0.80259D-02	0.281790-01	0.71 633D-01	0.10851D 00	0.119430 00
0.50D 07	0.73018D-02	0.26085D-01	0.686 37D-01	0.10687D 00	0.118790 00
0.60D 07	0.66431D-02	0.24146D-01	0.65768D-01	0.10527D 00	0.11818D 00
0.70D 07	0.60437D-02	0.223520-01	0.63020D-01	0.10370D 00	0.11759D 00
0.80D 07	0.54985D-02	0.20691D-01	0.6 0387D-01	0.10216D 00	0.117030 00
0.90D 07	0.50024D-02	0.191530-01	0.578660-01	0.100650 00	0.11649D 00
0.10D 08	0.45511D-02	0.17730D-01	0.55450D-01	0.99165D-01	0.11597D 00
0.20D 08	0.17681D-02	0.81 928D-02	0.362240-01	0.85657D-01	0.11163D 00
0.300 08	0.68692D-03	0.378650-02	0.23682D-01	0.74161D-01	0.108250 00
0.40D 08	0.26681D-03	0.17502D-02	0.15490D-01	0.64275D-01	0.105370 00
0.50D 08	0.10354D-03	0.80886D-03	0.10134D-01	0.55734D-01	0.10276D 00
0.600 08	0.40157D-04	0.37359D-03	0.66312D-02	0.48338D-01	0.10031D 00
0.70D 08	0.15635D-04	0.17248D-03	0.43394D-02	0.41 927D-01	0.97965D-01
0.80D 08	0.61904D-05	0.79729D-04	0.28396D-02	0.36368D-01	0.95703D-01
0.903 08	0.255550-05	0.37075D-04	0.18579D-02	0.31547D-01	0.93506D-01
0.10D 09	0.1 1338D-05	0.1751 OD-04	0.121 54D-02	0.27365D-01	0.91 367D-01
0.20D 09			0.18895D-04	0.66 017D-02	0.72544D-01
0.30D 09			0.55378D-06	0.159140-02	0.57606D-01
0.40D 09				0.38298D-03	0.45743D-01
0.50D 09				0.93182D-04	0.36323D-01
0.60D 09				0.24230D-04	0.28844D-01
0.70D 09				0.74101D-05	0.22904D-01
0.80D 09				0.260590-05	0.181 88D-01
0.90D 09				0.66597D-06	0.14442D-01
0.10D 10					0.11468D-01
0.20D 10					0.11418D-02
0.30D 10					0.11420D-03
0.400 10					0.13475D-04

$r_{eD} = \infty$

t_D	q_D	t_D	q_D
0.100-01	0.98377D 00	0.400 05	0.127260 00
0.20D-01	0.80058D 00	0.500 05	0.12618D 00
0.30D-01	0.71620D 00	0.600 05	0.125401) 00
0.400-01	0.664400 00	0.70D 05	0.124820 00
0.50D-01	0.62818D 00	0.80D 05	0.124360 00
0.60D-01	0.60088D 00	0.900 05	0.124010 00
0.700-01	0.57928D 00	0.100 06	0.123720 00
0.830-01	0.561570 00	0.200 06	0.122530 00
0.900-01	0.546690 00	0.300 06	0.122240 00
0.10D 00	0.533920 00	0.400 06	0.12211D 00
0.200 00	0.461140 00	0.50D 06	0.122020 00
0.30D 00	0.426100 00	0.60D 06	0.121950 00
0.40D 00	0.40398D 00	0.700 06	0.121870 00
0.50D 00	0.385180 00	0.80D 06	0.12180D 03
0.60D 00	0.37608D 00	0.900 06	0.12173D 00
0.700 00	0.366370 00	0.109 07	0.121660 00
0.80D 00	0.35832D 00	0.200 07	0.12096D 00
0.90D 00	0.35148D 00	0.300 07	0.12030D 00
0.10D 01	0.345550 00	0.40D 07	0.11963D 00
0.20D 01	0.31080D 00	0.50D 07	0.119090 00
0.300 01	0.293340 00	0.600 07	0.118530 00
0.430 01	0.262030 00	0.700 07	0.11799D 00
0.50D 01	0.273620 00	0.80D 07	0.11749D 00
0.60D 01	0.26743D 00	0.90D 07	0.117010 C0
0.700 01	0.26225D 00	0.100 08	0.116550 00
0.80D 01	0.257920 00	0.200 08	0.112950 00
0.90D 01	0.254200 00	0.30D 08	0.11054D 03
0.10D 02	0.25097D 00	0.403 08	0.10880D 00
0.20D 02	0.231510 00	0.500 08	0.10747D 00
0.30D 02	0.221430 00	0.600 08	0.10641D 00
0.40D 02	0.214770 00	0.703 05	0.105540 00
0.50D 02	0.20987D 00	0.80D 05	0.104790 00
0.600 02	0.20603D 00	0.900 05	0.10414D 00
0.700 02	0.20288D 00	0.10D 09	0.10357D 00
0.800 02	0.200230 00	0.200 09	0.999670-01
0.900 02	0.197950 00	0.30D 09	0.97982D-01
0.100 03	0.19596D 00	0.400 09	0.96622D-01
0.20D 03	0.18374D 00	0.50D 09	0.95594D-01
0.300 03	0.177270 00	0.600 09	0.94770D-01
0.403 03	0.172950 00	0.700 09	0.940550-01
0.500 03	0.16975D 00	0.500 09	0.93499D-01
0.600 03	0.16721D 00	0.90D 09	0.92988D-01
0.700 03	0.165130 00	0.10D 10	0.925360-01
0.80D 03	0.163370 00	0.200 10	0.89670D-01
0.90D 03	0.16185D 00	0.30D 10	0.85 0740-01
0.100 04	0.160520 00	0.40D 10	0.66 976D -01
0.20D 04	0.15229D 00	0.500 10	0.86143D-01
0.30D 04	0.14791D 00	0.600 10	0.854 740-01
0.40D a4	0.144980 00	0.70D 10	0.84916D-01
0.500 04	0.142610 00	0.80D 10	0.84439D-01
0.60D 04	0.14110D 00	0.90D 10	0.84023D-01
0.70D C4	0.139710 00	0.100 11	0.83653D-01
0.80D c4	0.136540 00	0.200 11	0.81 3040-01
0.90D 04	0.137530 00	0.30D 11	0.79989D-01
0.100 05	0.136650 00	0.400 11	0.790320-01
0.20D C5	0.131420 00	0.50D 11	0.763920-01
0.300 05	0.12884D 00	0.600 11	0.77837D-01
		0.700 11	0.773750-01
		0.800 11	0.76 97E0-01
		0.900 11	0.76632D-01

q_D FOR **DIFFERENT** r_{eD} VALUES (ω = 0.01, $\lambda = 10^{-4}$)

t_D	r_{eD} = 10	20	50	100	200
0.1 OD-01	0.98383D 00	0.98383D 00	0.98383D 00	0.983830 00	
0.20D-01	0.80067D 00	0.80067D 00	0.800670 00	0.80067D 00	0.800670 00
0.30D-01	0.71630D 00	0.716300 00	0.716300 00	0.716300 00	0.716300 00
0.40D-01	0.66452D 00	0.66452D 00	0.664520 00	0.66452D 00	0.664520 00
0.50D-01	0.62832D 00	0.626320 00	0.62832D 00	0.62832D 00	0.628320 00
0.600-01	0.60104D 00	0.60104D 00	0.60104D 00	0.601040 00	0.601040 00
0.70D-01	0.579450 00	0.57945D 00	0.579450 00	0.57945D 00	0.57945D 00
0.80D-01	0.561750 00	0.56175D 00	0.56175D 00	0.561750 00	0.561750 00
0.90D-01	0.54688D 00	0.546880 00	0.54688D 00	0.54688D 00	0.54688D 00
0.10D 00	0.53412D 00	0.53412D 00	0.53412D 00	0.53412D 00	0.53412D 00
0.20D 00	0.46145D 00	0.46145D 00	0.461450 00	0.46145D 00	0.46145D 00
0.30D 00	0.42650D 00	0.426500 00	0.42650D 00	0.426500 00	0.42650D 00
0.400 00	0.355280 00	0.40445D 00	0.40445D 00	0.40445D 00	0.40445D 00
0.50D 00	0.31485D 00	0.38872D 00	0.38872D 00	0.38872D 00	0.38872D 00
0.60D 00	0.27908D 00	0.376690 00	0.37669D 00	0.37669D 00	0.376693 00
0.70D 00	0.24745D 00	0.36704D 00	0.36704D 00	0.367040 00	0.367040 00
0.80D 00	0.21946D 00	0.359050 00	0.35905D 00	0.35905D 00	0.359058 00
0.900 00	0.194710 00	0.352270 00	0.352270 00	0.35227D 00	0.35227D 00
0.10D 01	0.17281D 00	0.346410 00	0.346410 00	0.34641D 00	0.34641D 00
0.200 01	0.54190D-01	0.274690 00	0.31213D 00	0.31213D 00	0.31213D 00
0.300 01	0.19370D-01	0.222920 00	0.29510D 00	0.29510D 00	0.29510D 00
0.400 01	0.91471D-02	0.181640 00	0.28418D 00	0.28418D 00	0.28418D 00
0.50D 01	0.615140-02	0.14872D 00	0.27632D 00	0.27632D 00	0.27632D 00
0.600 01	0.52787D-02	0.122460 00	0.27028D 00	0.27028D 00	0.27028D 00
0.70D 01	0.50254D-02	0.10153D 00	0.26542D 00	0.26542D 00	0.265420 00
0.80D 01	0.4 9499D-02	0.84830D-01	0.255520 00	0.261400 00	0.261400 00
0.90D 01	0.492450-02	0.71 51SO-01	0.249750 00	0.25798D 00	0.25798D 00
0.10D 02	0.49134D-02	0.60896D-01	0.244220 00	0.25504D 00	0.255040 00
0.20D 02	0.49000D-02	0.23414D-01	0.19862D 00	0.23816D 00	0.23816D 00
0.30D 02	0.48986D-02	0.1 95040-01	0.166490 00	0.230268 00	0.23026D 00
0.40D 02	0.48932D-02	0.19087D-01	0.14381D 00	0.21986D 00	0.22555D 00
0.50D 02	0.48878D-02	0.19024D-01	0.127810 00	0.21321D 00	0.22240D 00
0.6CD 02	0.48826D-02	0.189960-01	0.11651D 00	0.207500 00	0.22017D CO
0.70D 02	0.48776D-02	0.18974D-01	0.108520 00	0.202600 00	0.21851D 00
0.80D 02	0.48727D-02	0.18955D-01	0.10287D 00	0.19837D 00	0.217240 00
0.900 02	0.48678D-02	0.18937D-01	0.98866D-01	0.194740 00	0.21625D 00
0.10D 03	0.48630D-02	0.18920D-01	0.96024D-01	0.191600 00	0.21546D 00
0.20D 03	0.481453-02	0.18741D-01	0.88947D-01	0.176350 00	0.20989D 00
0.30D 03	0.47665D-02	0.18560D-01	0.881130-01	0.17257D 00	0.20808D 00
0.40D 03	0.471 90D-02	0.183620-01	0.87466D-01	0.171250 00	0.20729D 00
0.50D 03	0.4671 9D-02	0.18205D-01	0.868310-01	0.170490 00	0.206830 00
0.60D 03	0.46254D-02	0.18030D-01	0.86204D-01	0.16985D 00	0.206483 00
0.70D 03	0.45792D-02	0.17856D-01	0.85581D-01	0.169230 00	0.20617D 00
0.80D 03	0.45336D-02	0.17684D-01	0.84 963D-01	0.16863D 00	0.20587D 00
0.90D 03	0.44884D-02	0.1 7514D-01	0.84 349D-01	0.16802D 00	0.205570 00
0.10D 04	0.44436D-02	0.17346D-01	0.83739D-01	0.16742D 00	0.205260 00
0.20D 04	0.40199D-02	0.15748D-01	0.77878D-01	0.161550 00	0.20242D 00
0.30D 04	0.36365D-02	0.142970-01	0.72427D-01	0.155690 00	0.19965D 00
0.400 04	0.32897D-02	0.129800-01	0.673590-01	0.150450 00	0.19698D 00
0.50D 04	0.297600-02	0.11 784D-01	0.62647D-01	0.145210 00	0.19439D 00
0.60D 04	0.26922D-02	0.106980-01	0.582653-01	0.140160 00	0.19189D 00
0.70D 04	0.24355D-02	0.971 24D-02	0.541 91D-01	0.13530D 00	0.18946D 00
0.80D 04	0.22032D-02	0.881760-02	0.50401D-01	0.13062D 00	0.187100 00
0.90D 04	0.19931D-02	0.80052D-02	0.46878D-01	0.12610D 00	0.18480D 00
0.10D 05	0.18031D-02	0.72677D-02	0.43601D-01	0.12176D 00	0.18257D 00
0.200 05	0.66187D-03	0.276460-02	0.21130D-01	0.85948D-01	0.16289D 00
0.300 05	0.24296D-03	0.105170-02	0.10257D-01	0.60869D-01	0.14653D 03
0.400 05	0.89148D-04	0.400000-03	0.49605D-02	0.43184D-01	0.13233D 00
0.500 05	0.32674D-04	0.15198D-03	0.24192D-02	0.30666D-01	0.11972D 00
0.60D 05	0.1 1979D-04	0.57728D-04	0.11750D-02	0.21 787D-01	0.10840D 00
0.700 05	0.44274D-05	0.22044D-04	0.57054D-03	0.15484D-01	0.951920-01
0.800 05	0.168500-05	0.85929D-05	0.27713D-03	0.11005D-01	0.88959D-01
0.90D 05	0.68378D-06	0.35200D-05	0.13498D-03	0.78226D-02	0.80601D-01
0.10D 06	0.30448D-06	0.156 31D-05	0.66282D-04	0.556030-02	0.73031 D-01
0.20D 06				0.18338D-03	0.27247D-01
0.30D 06				0.88967D-05	0.10166D-01
0.40D 06					0.3791 7D-02
0.50D 06					0.141 27D-02
0.600 06					0.52632D-03
0.70D 06					0.197400-03
0.80D 06					0.759 16D-04
0.90D 06					0.30911D-04
0.10D 07					0.13761D-04

q_D FOR DIFFERENT VALUES OF r_{eD}

t_D	500	1,000	2,000	4,000	10,000
0.10D-01	0.983630 00	0.983830 00	0.983830 00	0.983830 00	0.983830 00
0.20D-01	0.800670 00	0.800670 00	0.800670 00	0.800670 00	0.800670 00
0.30D-01	0.716300 00	0.716300 00	0.716303 00	0.716500 00	0.716300 00
0.400-01	0.664520 00	0.664520 00	0.664520 00	0.664520 00	0.664520 00
0.50D-01	0.628320 00	0.628320 00	0.628320 00	0.628320 00	0.628320 00
0.60D-01	0.601040 00	0.601040 00	0.601040 00	0.60104D 00	0.601040 00
0.70D-01	0.57945D 00	0.579450 00	0.579450 00	0.57945D 00	0.579450 00
0.80D-01	0.561750 00	0.561750 00	0.561750 00	0.561750 00	0.561750 00
0.900-01	0.56688D 00	0.546830 00	0.546880 00	0.546880 00	0.54688D 00
0.100 00	0.534120 00	0.534120 00	0.534120 00	0.534120 00	0.534120 00
0.200 00	0.461450 00	0.461450 00	0.461450 00	0.461450 00	0.461450 00
0.300 00	0.426500 00	0.426503 00	0.42650D 00	0.426500 00	0.426500 00
0.400 00	0.404450 00	0.404450 00	0.40445D 00	0.404450 00	0.404450 00
0.503 00	0.388720 00	0.388720 00	0.388720 00	0.388720 00	0.38872D 00
0.600 00	0.37669D 00	0.376690 00	0.376690 00	0.376690 00	0.376690 00
0.700 00	0.36704D 00	0.367040 00	0.367040 00	0.367040 00	0.367040 00
0.800 00	0.359050 00	0.359050 00	0.359050 00	0.359050 00	0.359050 00
0.90D C0	0.352270 00	0.352270 00	0.352270 00	0.352270 00	0.352270 00
0.100 01	0.346410 00	0.346410 00	0.346410 00	0.346410 00	0.346410 00
0.200 01	0.312130 00	0.312130 00	0.312130 00	0.312130 00	0.312130 00
0.303 01	0.255100 00	0.295100 00	0.295100 00	0.295100 00	0.295100 00
0.40D 01	0.284183 00	0.284180 00	0.284180 00	0.284180 00	0.284180 00
0.503 01	0.27632D 00	0.276320 00	0.276320 00	0.276320 00	0.276320 00
0.60D 01	0.270280 00	0.230280 00	0.270260 00	0.270280 00	0.270280 00
0.700 01	0.26542D 00	0.265420 00	0.265420 00	0.265420 00	0.265420 00
0.80D 01	0.26140D 00	0.261400 00	0.261400 00	0.261409 00	0.261400 00
0.900 01	0.25798D 00	0.257930 00	0.257980 00	0.257980 00	0.25798D 00
0.100 02	0.255040 00	0.255040 00	0.255040 00	0.255040 00	0.255040 00
0.200 02	0.238160 00	0.235160 00	0.238160 00	0.238160 00	0.233160 00
0.300 02	0.230260 00	0.230260 00	0.230260 00	0.230260 00	0.230260 00
0.400 02	0.225550 00	0.225550 00	0.225550 00	0.22555'3 00	0.225550 00
0.500 02	0.22240D 00	0.222400 00	0.22240D 00	0.222400 00	0.222400 00
0.600 02	0.22017D 00	0.22017D 00	0.220170 00	0.220170 00	0.220170 00
0.703 02	0.218510 00	0.218510 00	0.218510 00	0.218510 00	0.218510 00
0.80D 02	0.21724D 00	0.217240 00	0.217240 00	0.217240 00	0.217240 00
0.900 02	0.216250 00	0.216250 00	0.216250 00	0.216250 00	0.21625D C0
0.100 03	0.215$60 00	0.215460 00	0.21546D 00	0.215450 00	0.215460 00
0.200 03	0.212230 00	0.212230 00	0.212230 00	0.212230 00	0.212230 00
0.309 03	0.211153 00	0.211450 00	0.211450 00	0.211450 00	0.211450 00
0.400 03	0.211390 00	0.211090 00	0.211090 00	0.211090 00	0.21109D 00
0.509 03	0.21083D 00	0.210330 00	0.210830 00	0.21083D 00	0.210830 00
0.60D 03	0.210500 00	0.210600 00	0.210600 00	0.210600 00	0.210600 00
0.700 03	0.210360 00	0.210380 00	0.210380 00	0.210360 00	0.210380 00
0.80D 03	0.210160 00	0.210170 00	0.210170 00	0.210170 00	0.210170 00
0.90D 03	0.209940 00	0.209950 00	0.209950 00	0.209950 00	0.209950 00
0.100 04	0.209730 00	0.209740 00	0.209740 00	0.209740 00	0.209740 00
0.20D 04	0.207560 00	0.207670 00	0.20767D 00	0.207670 00	0.207670 00
0.300 04	0.205710 00	0.205730 00	0.205730 00	0.205730 00	0.205730 00
0.400 04	0.203370 00	0.203890 00	0.203890 00	0.203890 00	0.20389D 00
0.500 04	0.20213D 00	0.202160 00	0.202160 00	0.202160 00	0.202160 00
0.60D 04	0.200180 00	0.200520 00	0.200520 00	0.200520 00	0.200520 00
0.700 04	0.19892D 00	0.19897D 00	0.198970 00	0.196970 00	0.196970 00
0.800 04	0.157550 00	0.197500 00	0.197500 00	0.197500 00	0.197503 00
0.900 04	0.156350 00	0.196120 00	0.196120 00	0.196120 00	0.196120 00
0.10D 05	0.154730 00	0.194800 00	0.19480D 00	0.194800 00	0.19480D 00
0.200 05	0.184550 00	0.184680 00	0.184660 00	0.18468D 00	0.18468D 00
0.330 05	0.177560 00	0.178160 00	0.178160 00	0.178150 00	0.178160 00
0.40D 05	0.172720 00	0.173600 00	0.173600 00	0.173600 00	0.173600 00
0.530 05	0.166320 00	0.170210 00	0.170210 00	0.17021D 00	0.170210 00
0.600 05	0.16552D 00	0.167540 00	0.167540 00	0.167540 0C	0.167540 C0
0.709 05	0.162510 00	0.165360 00	0.165370 00	0.165370 00	0.165370 00
0.80D 05	0.159930 00	0.163520 00	0.163530 00	0.163530 00	0.163530 00
0.90D 05	0.157120 00	0.161940 00	0.161960 00	0.161950 00	0.161960 00
0.103 06	0.155330 00	0.160550 00	0.160520 00	0.16058D 00	0.160583 00
0.200 06	0.134330 00	0.151690 00	0.152110 00	0.152110 00	0.152110 00
0.300 06	0.116100 00	0.146060 00	0.147580 00	0.147560 00	0.14758D 00
0.400 06	0.100570 00	0.141240 00	0.144530 00	0.144530 00	0.144530 00
0.500 06	0.871110-01	0.136710 00	0.142240 00	0.142250 00	0.142250 00
0.600 06	0.754570-01	0.132360 00	0.140400 00	0.140450 00	0.140450 00
0.700 06	0.653520-01	0.128160 00	0.138850 00	0.138950 00	0.13895D 00
0.80D 06	0.566180-01	0.124090 00	0.13749D 00	0.137690 00	0.137690 00

t_D	500	1,000	2,000	4,000	10,000
0.900 06	0.490430-01	0.120150 00	0.136250 00	0.13659D 00	0.13659D 00
0.100 07	0.42482D-01	0.116340 00	0.135110 00	0.13562D 00	0.13562D 00
0.200 07	0.101040-01	0.842690-01	0.125330 00	0.129570 00	0.12958D 00
0.300 07	0.24010D-02	0.610390-01	0.116540 00	0.126190 00	0.12628D 00
0.400 07	0.56964D-03	0.442120-01	0.108370 00	0.123670 00	0.124050 00
0.500 07	0.136840-03	0.320240-01	0.100770 00	0.121480 00	0.122370 00
0.600 07	0.35341D-04	0.231 96D-01	0.937020-01	0.11943D 00	0.121030 00
0.700 07	0.108090-04	0.168020-01	0.871 310-01	0.117460 00	0.119910 00
0.80D 07	0.377630-05	0.12 1700-01	0.81021D-01	0.115520 00	0.11897D 00
0.900 07	0.85946D-06	0.881540-02	0.753403-01	0.113630 00	0.11815D 00
0.100 08		0.638510-02	0.70057D-01	0.111760 00	0.11742D 00
0.200 08		0.253310-03	0.338620-01	0.94740D-01	0.11276D 00
0.300 C8		0.13028D-04	0.163670-01	0.803110-01	0.109760 00
0.400 08		0.81 335D-06	0.791 130-02	0.680790-01	0.107130 00
0.500 08			0.38233D-02	0.577100-01	0.10461D 00
0.600 08			0.18467D-02	0.48920D-01	0.10217D 00
0.700 08			0.891 460-03	0.414690-01	0.99790D-01
0.800 C8			0.430410-03	0.351530-01	0.97464D-01
0.900 08			0.20839D-03	0.297990-01	0.951910-01
0.100 09			0.101760-03	0.252600-01	0.929720-01
0.200 09				0.48397D-02	0.73434D-01
0.30D 09				0.925590-03	0.58002D-01
0.403 09				0.177470-03	0.458140-01
0.500 09				0.36019D-04	0.361 86D-01
0.600 09				0.83780D-05	0.285920-01
0.700 09				0.262250-05	0.225760-01
0.803 09				0.348780-06	0.178310-01
0.900 09					0.140840-01
0.100 10					0.1 1125D-01
0.20D 10					0.104990-02
0.30D 10					0.99841D-04
0.400 10					0.11574D-04
0.500 10					0.19559D-05

$r_{eD} = \infty$

t_D	q_D	t_D	q_D	t_D	q_D	t_D	q_D
0.10D-01	0.98383D 00	0.500 02	0.2224013 00	0.90D 05	0.161960 00	0.400 09	0.96611D-01
0.200-01	0.80067D 00	0.600 02	0.220170 00	0.103 06	0.16058D 00	0.500 09	0.955850-0f
0.300-01	0.716300 00	0.70D 02	0.218510 00	0.200 06	0.152110 00	0.600 09	0.94763D-01
0.400-01	0.664520 00	0.800 02	0.217240 00	0.30D 06	0.147550 00	0.700 09	0.940753-01
0.500-01	0.62832D 00	0.900 02	0.216250 00	0.400 06	0.144530 00	0.80D 09	0.93494D-01
0.600-01	0.601040 00	0.100 03	0.215460 00	0.500 06	0.142250 00	0.900 09	0.929540-01
0.700-01	0.579460 00	0.20D 03	0.212230 00	0.600 06	0.140450 00	0.100 10	0.92533D-01
0.80D-01	0.561760 00	0.300 03	0.211450 00	0.700 06	0.133950 00	0.200 10	0.89668D-01
0.903-01	0.54688D 00	0.400 03	0.211090 00	0.800 06	0.137690 00	0.300 10	0.880730-01
0.100 00	0.534120 00	0.500 03	0.21083D 00	0.900 06	0.136590 00	0.40D 10	0.86975D-01
0.203 00	0.461450 00	0.600 03	0.210600 00	0.100 07	0.135620 00	0.505 10	0.86142D-01
0.30D 00	0.42650D 00	0.700 03	0.210380 00	0.20D 07	0.12958D 00	0.600 10	0.85473D-01
0.400 00	0.404450 00	0.800 03	0.210170 00	0.300 07	0.126280 00	0.705 10	0.84916D-01
0.50D 00	0.38572D 00	0.900 03	0.209950 00	0.400 07	0.124050 00	0.800 10	0.84439D-01
0.605 00	0.376690 00	0.10D 04	0.209740 00	0.500 07	0.12237D 00	0.90D 10	0.84022D-01
0.703 00	0.367040 00	0.200 04	0.207670 00	0.600 07	0.121030 00	0.100 11	0.83653D-01
0.80D 00	0.359050 00	0.300 04	0.205730 00	0.700 07	0.119910 00	0.20D 11	0.81 304D-01
0.90D 00	0.352270 00	0.400 04	0.20389D 00	0.800 07	0.118970 00	0.300 11	0.79989D-01
0.100 01	0.346410 00	0.50D 04	0.202160 00	0.900 07	0.11815D 00	0.40D 11	0.79082D-01
0.200 01	0.312130 00	0.60D 04	0.200520 00	0.100 08	0.117420 00	0.500 11	0.78392D-01
0.300 01	0.295100 00	0.70D 04	0.198970 00	0.203 08	0.112860 00	0.600 11	0.77837D-01
0.400 01	0.28418D 00	0.800 04	0.197500 00	0.30D 08	0.110350 00	0.700 11	0.77375D-01
0.500 01	0.276320 00	0.90D 04	0.196120 00	0.400 08	0.108630 00	0.800 11	0.76978D-01
0.600 01	0.270260 00	0.10D 05	0.194800 00	0.500 08	0.107340 00	0.900 11	0.76631D-01
0.700 01	0.265420 00	0.20D 05	0.184680 00	0.600 08	0.106310 00		
0.80D 01	0.261400 00	0.300 05	0.178160 00	0.700 08	0.105450 00		
0.900 01	0.257980 00	0.400 05	0.173600 00	0.800 08	0.104710 00		
0.100 02	0.255040 00	0.50D 05	0.170210 00	0.900 08	0.104070 00		
0.20D 02	0.238160 00	0.60D 05	0.167540 00	0.100 09	0.103510 00		
0.30D 02	0.230260 00	0.700 05	0.16537D 00	0.200 09	0.999420-01		
0.400 02	0.225550 00	0.80D 05	0.163530 00	0.300 09	0.97966D-01		

q_D FOR DIFFERENT **VALUES** OF r_{eD} (ω = 0.01, $\lambda = 10^{-9}$)

t_D	r_{eD} = 10	20	50	100	200
0.10D-01	0.98377D 00	0.983770 00	0.983770 03	0.983770 00	0.98377D 00
0.20D-01	0.80058D 00	0.80058D 00	0.800580 00	0.80058D 00	0.80058D 00
0.300-01	0.716200 00	0.716200 00	0.716200 00	0.716200 00	0.71620D 00
0.400-01	0.664400 00	0.664400 00	0.664400 00	0.664400 00	0.66440D 00
0.500-01	0.628180 00	0.62818D 00	0.628180 00	0.62818D 00	0.62818D 00
0.60D-01	0.600880 00	0.600680 00	0.600880 00	0.600880 00	0.60088D 00
0.700-01	0.579280 00	0.579250 00	0.579280 00	0.579280 00	0.57928D 00
0.800-01	0.561570 00	0.5615713 00	0.561570 00	0.561570 00	0.56157D 00
0.900-01	0.546680 00	0.546683 00	0.546680 00	0.546680 00	0.54668D 00
0.100 00	0.533920 00	0.533920 00	0.533920 00	0.533920 00	0.53392D 00
0.200 00	0.461140 00	0.461140 00	0.461140 00	0.461140 00	0.46114D 00
0.300 00	0.426100 00	0.426100 00	0.426100 03	0.426105 00	0.42610D 00
0.400 00	0.35467D 00	0.403980 00	0.40398D 00	0.40398D 00	0.40398D 00
0.500 00	0.314050 00	0.388180 00	0.386180 00	0.388185 00	0.38818D 00
0.600 00	0.276090 00	0.37608D 00	0.376080 00	0.376080 00	0.37608D 00
0.700 00	0.246250 00	0.366370 00	0.360370 00	0.366370 00	0.36637D 00
0.80D 00	0.218050 00	0.358320 00	0.358320 00	0.358320 00	0.35832D 00
0.900 00	0.193090 00	0.35148D 00	0.35148D 00	0.35148D 00	0.35148D 00
0.100 01	0.170980 00	0.34556D 00	0.345560 00	0.345560 00	0.34556D 00
0.200 01	0.50688D-01	0.272620 00	0.310500 00	0.310800 00	0.31080D 00
0.300 01	0.150230-01	0.219740 00	0.29334D 00	0.293340 00	0.29334D 00
0.400 01	0.444660-02	0.177000 00	0.282030 00	0.282030 00	0.28203D 00
0.503 01	0.13162D-02	0.14257D 00	0.273810 00	0.273810 00	0.27381D 00
0.600 01	0.395160-03	0.114840 00	0.26743D 00	0.267430 00	0.26743D 00
0.700 01	0.125500-03	0.925040-01	0.262250 00	0.262250 00	0.26225D 00
0.800 01	0.44967D-04	0.745120-01	0.25166D 00	0.257910 00	0.25791D 00
0.900 01	0.18246D-04	0.600190-01	0.245370 00	0.254200 00	0.25420D 00
0.10D 02	0.703340-05	0.48345D-01	0.239290 00	0.250560 00	0.25096D 00
0.200 02		0.55543D-02	0.18646D 00	0.23151D 00	0.23151D 00
0.30D 02		0.638100-03	0.145320 00	0.22142D 03	0.22142D 00
0.400 02		0.80848D-04	0.113253 00	0.207050 00	0.21476D 00
0.500 02		0.14741 D-04	0.88265D-01	0.19666D 00	0.20936D 00
0.600 02		0.206320-05	0.60790D-01	0.18681D 00	0.20601D 00
0.700 02			0.536120-01	0.177455 00	0.20287D 00
0.800 02			0.41 783D-01	0.168570 00	0.20021D 00
0.900 02			0.32564D-01	0.160130 00	0.19793D 00
0.190 03			0.25380D-01	0.152110 00	0.19593D 00
0.200 03			-0.209520-02	4.91 011D-01	0.17422D 00
0.300 03			0.177270-03	0.544550-01	0.15620D 00
0.400 03			0.2 10270-04	0.32583D-01	0.14005D 00
0.50D 03			0.399270-05	0.19497D-01	0.12557D 00
0.600 03				0.11667D-01	0.11259D 00
0.700 03				0.6961 5D-02	0.10095D 00
0.800 03				0.417750-02	0.90508D-01
0.900 03				0.249960-02	0.81151D-01
0.100 04				0.14961D-02	0.72761D-01
0.200 04				0.180690-04	0.24439D-01
0.300 04				0.306560-05	0.82169D-02
0.40D 04				0.27556D-05	0.27694D-02
0.500 04				0.43354D-05	0.94111D-03
0.600 04				0.52715D-05	0.32961D-03
0.700 04				0.557570-05	0.12626D-03
0.800 04				0.55678D-05	0.58696D-04
0.900 04				0.54566D-05	0.35640D-04
0.10D 05				0.533430-05	0.26975D-04
0.230 05				0.495950-05	0.18428D-04
0.30D 05				0.49787D-05	0.20375D-04
0.400 05				0.499180-05	0.20438D-04
0.500 05				0.49970D-05	0.20217D-04
0.600 05				0.499890-05	0.20074D-04
0.700 05				0.499690-05	0.20001D-04
0.800 05				0.499890-05	0.19970D-04
0.900 05				0.49987D-05	0.19959D-04
0.10D 06				0.49993D-05	0.19960D-04
0.200 06				0.49985D-05	0.199890-04
0.30D 06				0.49977D-05	0.1999 [illegible]-04
0.400 06				0.499740-05	0.19990D-04

t_D	100	200
0.50D 06	0.49969D-05	0.19988D-04
0.60D 06	0.49964D-05	0.19986D-04
0.70D 06	0.49959D-05	0.19984D-04
0.80D 06	0.49954D-05	0.19981D-04
0.90D 06	0.49949D-05	0.19980D-04
0.10D 07	0.49944D-05	0.19978D-04
0.20D 07	0.49893D-05	0.19957D-04
0.30D 07	0.49843D-05	0.19937D-04
0.40D 07	0.49793D-05	0.19917D-04
0.50D 07	0.49742D-05	0.19897D-04
0.60D 07	0.49692D-05	0.19877D-04
0.70D 07	0.49642D-05	0.19857D-04
0.80D 07	0.49592D-05	0.19837D-04
0.90D 07	0.49542D-05	0.19817D-04
0.10D 08	0.49492D-05	0.19797D-04
0.20D 08	0.48994D-05	0.19598D-04
0.30D 08	0.48502D-05	0.19401D-04
0.40D 08	0.48014D-05	0.19206D-04
0.50D 08	0.47532D-05	0.19013D-04
0.60D 08	0.47054D-05	0.18822D-04
0.70D 08	0.46581D-05	0.18633D-04
0.80D 08	0.46113D-05	0.18445D-04
0.90D 08	0.45650D-05	0.18260D-04
0.10D 09	0.45191D-05	0.18077D-04
0.20D 09	0.40849D-05	0.16340D-04
0.30D 09	0.36925D-05	0.14770D-04
0.40D 09	0.33377D-05	0.13351D-04
0.50D 09	0.30170D-05	0.12069D-04
0.60D 09	0.27272D-05	0.10909D-04
0.70D 09	0.24652D-05	0.96612D-05
0.80D 09	0.22283D-05	0.89139D-05
0.90D 09	0.20142D-05	0.80576D-05
0.10D 10	0.18207D-05	0.72835D-05
0.20D 10	0.66310D-06	0.26528D-05
0.30D 10	0.24150D-06	0.96621D-06
0.40D 10	0.87912D-07	0.35175D-06
0.50D 10	0.31966D-07	0.12791D-06
0.60D 10	0.11629D-07	0.46533D-07
0.70D 10	0.42686D-08	0.17085D-07
0.80D 10	0.16161D-08	0.64690D-08
0.90D 10	0.65438D-09	0.26216D-08
0.10D 11	0.29202D-09	0.11682D-08

t_D	500	1,000	2,000	4,000	10,000
0.10D-01	0.983770 00	0.963770 00	0.98377D 00	0.983770 00	0.983770 00
0.200-01	0.80058D 00	0.800580 00	0.800580 00	0.800533 00	0.800580 0C
0.300-01	0.716200 00	0.716200 00	0.71620D 00	0.716200 00	0.71620D 03
0.400-01	0.66440D 00	0.664400 00	0.66440D 00	0.664400 00	0.664400 00
0.500-01	0.626180 00	0.62818D 00	0.628130 00	0.628180 00	0.628180 00
0.60D-01	0.600380 00	0.600630 00	0.60088D 00	0.600880 00	0.60088D 00
0.700-01	0.57928D 00	0.579289 00	0.579260 00	0.579280 00	0.57928D 00
0.80D-01	0.561570 00	0.56157D 03	0.561570 00	0.561570 00	0.561570 00
0.90D-01	0.546680 00	0.546680 00	0.54668D 00	0.546669 00	0.54668D 00
0.100 00	0.533920 00	0.533920 00	0.533920 00	0.533920 00	0.533020 00
0.200 00	0.461140 00	0.461140 00	0.4611411 00	0.46114D 00	0.46114D 00
0.300 00	0.426100 00	0.426100 00	0.426100 00	0.426100 00	0.426100 00
0.400 00	0.403980 00	0.403980 00	0.40398D 00	0.403950 00	0.40398D 00
0.500 00	0.368180 00	0.38818D 00	0.333180 00	0.38818D 00	0.38818D 00
0.600 00	0.376085 00	0.376083 00	0.376080 03	0.376380 00	0.37608D 00
0.700 00	0.366370 00	0.366370 00	0.366370 00	0.366370 00	0.366370 00
0.800 00	0.358320 00	0.358320 30	0.358320 00	0.35832D 00	0.358320 00
0.900 00	0.351480 00	0.351450 00	0.351480 00	0.35148D 00	0.351480 00
0.100 01	0.365560 00	0.345560 00	0.345560 00	0.34556D 00	0.345560 00
0.200 01	0.310800 00	0.313600 00	0.310800 00	0.31080D 00	0.31080D 00
0.300 01	0.293340 00	0.293340 00	0.293340 03	0.293340 00	0.293340 00
0.400 01	0.28203D 00	0.28203D 00	0.282030 00	0.28203 C0	0.28203D 00
0.500 01	0.273815 00	0.273810 00	0.273810 00	0.273610 00	0.2736113 00
0.600 01	0.26743D 00	0.267430 00	0.267430 00	0.267430 00	0.267430 00
0.700 01	0.262250 00	0.262250 00	0.262250 00	0.262250 00	0.262250 00
0.860 01	0.257310 00	0.257910 00	0.257910 0C	0.257910 00	0.257910 00
0.900 01	0.254200 00	0.25420D 00	0.254200 00	0.254200 00	0.254209 00
0.100 02	0.250960 00	0.25096D 00	0.250960 00	0.250950 00	0.250360 03
0.200 02	0.231510 0C	0.231510 00	0.231510 00	0.231540 00	0.231510 00
0.300 02	0.221420 00	0.221420 00	0.22142D 00	0.22142D 30	0.221420 00
0.400 02	0.214763 00	0.214760 00	0.21476D 00	0.214760 00	0.21476D 00
0.500 02	0.209600 00	0.209960 00	0.209863 00	0.209660 00	0.203800 00
0.600 02	0.206010 00	0.206010 00	0.206010 00	0.205010 00	0.20601D 00
0.700 02	0.202870 00	0.202970 00	0.202870 00	0.202870 00	0.20287D 00
0.800 02	0.20021D 00	0.20021D 00	0.200210 00	0.200210 03	0.200210 00
0.900 02	0.197930 C0	0.197930 00	0.197930 00	0.197930 00	0.197930 00
0.100 03	0.195930 00	0.19593D 00	0.195930 00	0.19593D 00	0.195930 00
0.200 03	0.18370D 00	0.183700 00	0.183700 00	0.183700 00	0.18370D 00
0.330 03	0.177220 00	0.177220 00	0.177220 00	0.177220 00	0.177220 00
0.400 03	0.172680 00	0.172880 00	0.17288D 00	0.172380 00	0.172880 00
0.500 03	0.169660 00	0.169660 00	0.16966D 00	0.169660 C0	0.169660 00
0.600 03	0.167120 00	0.167120 00	0.167120 C0	0.167120 00	0.16712D 00
0.700 03	0.16502D C0	0.165020 00	0.165020 00	0.165020 00	0.165020 03
0.800 03	0.161370 00	0.16325D 00	0.163250 00	0.16325D 00	0.163250 00
0.900 03	0.153960 00	0.161710 00	0.161710 00	0.161710 00	0.161710 00
0.10D 04	0.15665D 00	0.160370 00	0.160370 00	0.160370 00	0.160370 00
0.200 04	0.135390 C0	0.152030 00	0.15203D 00	0.152030 00	0.152039 00
0.300 04	0.117040 00	0.147530 00	0.147530 00	0.147535 00	0.147530 00
0.400 04	0.101180 00	0.14160D 00	0.144500 00	0.144500 00	0.1445311 00
0.500 04	0.874760-01	0.137070 00	0.142230 00	0.142230 00	0.14223D 00
0.600 04	0.756270-01	0.132710 00	0.140430 00	0.140433 00	0.14043D 00
0.700 04	0.65385D-01	0.128490 00	0.13894D 00	0.136940 00	0.136940 00
0.800 04	0.565330-01	0.124400 00	0.137680 00	0.13768D 00	0.137660 00
0.900 04	0.48881D-01	0.120440 00	0.136580 00	0.13658D 00	0.13658D 00
0.10D 05	0.42268D-01	0.116610 00	0.135620 00	0.135620 00	0.13562D 00
0.20D 05	0.99346D-02	0.844340-01	0.125430 00	0.129590 00	0.129590 0C
0.300 05	0.24063D-02	0.61 173D-01	0.116651) 00	0.126310 00	0.12631D 00
0.400 05	0.65466D-03	0.44358D-01	0.108500 00	0.12408D 00	0.124030 00
0.500 05	0.24979D-03	0.322030-01	0.100920 00	0.12241D 00	0.122410 00
0.600 05	0.15685D-03	0.23417D-01	0.938880-01	0.119510 00	0.121070 03
0.700 05	0.134700-03	0.170660-01	0.87353D-01	0.117540 03	0.11997D 00
0.800 05	0.128240-03	0.124740-01	0.81283D-01	0.115420 00	0.119030 00
0.900 05	0.12551D-03	0.915550-02	0.756440-01	0.113740 C0	0.11822D 00
0.100 06	0.124030-03	0.6 7561D-02	0.704060-01	0.111900 03	0.117500 00
0.200 06	0.124930-03	0.741740-03	0.347040-01	0.951200-01	0.113000 00
0.300 06	0.12525D-03	0.51077D-03	0.176280-01	0.81 0410-01	0.11055D 00
0.400 06	0.125000-03	0.499000-03	0.94604D-02	0.69225D-01	0.10744D 00
0.500 06	0.12487D-03	0.49674D-03	0.555310-02	0.593090-01	0.105040 00
0.600 06	0.1 2482D-03	0.4966 1C-03	0.368360-02	0.509870-01	0.102720 00
0.700 06	0.12480D-03	0.497160-03	0.278950-02	0.440030-01	0.100490 00

t_D	500	1,000	2,000	4,000	10,000
0.80D 06	0.124790-03	0.49772D-03	0.23625D-02	0.38141D-01	0.98333D-01
0.90D 06	0.12478D-03	0.49 309D-03	0.21590D-02	0.33222D-01	0.96245D-01
0.10D 07	0.12477D-03	0.49826D-03	0.206220-02	0.290930-01	0.94227D-01
0.200 07	0.12466D-03	0.49755D-03	0.196880-02	0.11273D-01	0.77368D-01
0.30D 07	0.124543-03	0.496970-03	0.19666D-02	0.81 770D-02	0.65315D-01
0.400 07	0.124410-03	0.49647D-03	0.19657D-02	0.76368D-02	0.56697D-01
0.500 07	0.12429D-03	0.49598D-03	0.196400-02	0.75386D-02	0.50532D-01
0.603 07	0.124160-03	0.49549D-03	0.196200-02	0.75152D-02	0.46121D-01
0.700 07	0.12404D-03	0.49499D-03	0.19600D-02	0.75041D-02	0.42962D-01
0.800 07	0.123910-03	0.49449D-03	0.19579D-02	0.74953D-02	0.40698D-01
0.900 07	0.123790-03	0.4 9400D-03	0.195590-02	0.74874D-02	0.39073D-01
0.100 08	0.12366D-03	0.49350D-03	0.19539D-02	0.74800D-02	0.37903D-01
0.200 08	0.12242D-03	0.488560-03	0.193450-02	0.741 06D-02	0.34896D-01
0.300 08	0.121 19D-03	0.48366D-03	0.191 54D-02	0.734030-02	0.34555D-01
0.40D 08	0.11 997D-03	0.47882D-03	0.18964D-02	0.72706D-02	0.34306D-01
0.50D 08	0.11 877D-03	0.47402D-03	0.187760-02	0.72016D-02	0.34063D-01
0.600 08	0.1 17570-03	0.46927D-03	0.185900-02	0.71333D-02	0.338220-01
0.70D 08	0.11639D-03	0.46457D-03	0.18405D-02	0.70657D-02	0.33583D-01
0.80D 08	0.11523D-03	0.459910-03	0.182230-02	0.69987D-02	0.333460-01
0.90D 08	0.11407D-03	0.45530D-03	0.180420-02	0.693230-02	0.331 10D-01
0.100 09	0.11292D-03	0.45074D-03	0.178630-02	0.656660-02	0.32876D-01
0.20D 09	0.10208D-03	0.407560-03	0.16169D-02	0.62427D-02	0.30624D-01
0.30D 09	0.922790-04	0.36852D-03	0.14636D-02	0.56755D-02	0.28526D-01
0.400 09	0.83419D-04	0.33322D-03	0.13248D-02	0.51598D-02	0.26572D-01
0.503 09	0.754103-04	0.301 30D-03	0.11991D-02	0.4691 00-02	0.247520-01
0.600 09	0.68169D-04	0.27243D-03	0.108540-02	0.42647D-02	0.23057D-01
0.700 09	0.616240-04	0.246340-03	0.98245D-03	0.387720-02	0.21478D-01
0.503 09	0.55707D-04	0.222740-03	0.88927D-03	0.352490-52	0.20007D-01
0.900 09	0.503593-04	0.201400-03	0.80493D-03	0.32046D-02	0.18637D-01
0.10D 10	0.455241)-04	0.18211D-03	0.72859D-03	0.29135D-02	0.173600-01
0.200 10	0.16591D-04	0.66527D-04	0.26699D-03	0.11239D-02	0.85410D-02
0.30D 10	0.60463D-05	0.243040-04	0.99312D-04	0.433540-03	0.42027D-02
0.40D 10	0.220253-05	0.88746D-05	0.36650D-04	0.16719D-03	0.20682D-02
0.50D 10	0.801390-06	0.323690-05	0.1 35110-04	0.64417D-04	0.101 77D-02
0.60D 10	0.29171D-06	0.1181 1D-05	0.49814D-05	0.248083-04	0.50060D-03
0.700 10	0.10715D-06	0.43474D-06	0.18508D-05	0.95950D-05	0.24611D-03
0.800 10	0.40587D-07	0.16491D-06	0.70675D-06	0.37780D-05	0.12098D-03
0.90D 10	0.16442D-07	0.66856D-07	0.28702D-06	0.155530-05	0.59596D-04
0.10D 11	0.73457D-08	0.296260-07	0.12782D-06	0.69029D-06	0.29554D-04

$r_{eD} = \infty$

t_D	q_D	t_D	q_D	t_D	q_D	t_D	q_D
0.10D-01	0.983770 00	0.600 02	0.20601D 00	0.200 06	0.11300D 00	0.700 09	0.92795D-01
0.200-01	0.600580 00	0.70D 02	0.20287D 00	0.300 06	0.110550 00	0.80D 09	0.92484D-01
0.300-Cl	0.716200 00	0.830 02	0.20021D 00	0.40D 06	0.10890D 00	0.900 09	0.92187D-01
0.40D-01	0.664400 03	0.900 02	0.19793D 00	0.500 06	0.107660 00	0.100 10	0.91 904D-01
0.500-01	0.62818D C0	0.100 03	0.195930 00	0.60D 06	0.10668D 00	0.200 10	0.89670D-01
0.60D-01	0.600630 00	0.200 03	0.183700 00	0.700 06	0.105370 00	0.30D 10	0.88157D-01
0.700-0 1	0.57928D 00	0.30D 03	0.17722D 00	0.80D 06	0.10519D 00	0.400 10	0.87057D-01
0.80D-01	0.56157D 00	0.400 03	0.17288D 00	0.90D 06	0.104610 00	0.50D 10	0.8621 1D-01
0.900-01	0.54668D 00	0.50D 03	0.169660 00	0.10D 07	0.10409D 00	0.60D 10	0.85530D-01
0.100 00	0.533923 00	0.60D 03	0.167120 00	0.200 07	0.10100D 00	0.700 10	0.84963D-01
0.20D 00	0.461140 30	0.700 03	0.16502D 00	0.30D 07	0.99455D-01	0.800 10	0.84479D-01
0.30D 00	0.425130 00	0.800 03	0.163250 00	0.400 07	0.98496D-01	0.90D 10	0.84057D-01
0.40D 00	0.40398D 00	0.900 03	0.161710 00	0.500 07	0.97838D-01	0.100 11	0.83684D-01
0.50D 00	0.38818D 00	0.10D 04	0.16037D 00	0.600 07	0.9736 ID-01	0.20D 11	0.81 317D-01
0.603 00	0.376000 00	0.20D 04	0.152030 00	0.70D 07	0.97000D-01	0.300 11	0.799953-01
0.700 00	0.36637D C0	0.300 04	0.147531) 00	0.80D 07	0.96721D-01	0.40D 11	0.79088D-01
0.80D 00	0.35832D 00	0.40D 04	0.144500 00	0.900 07	0.965600-01	0.50D 11	0.78397D-01
0.900 00	0.351420 00	0.500 04	0.14223D 00	0.10D 08	0.963220-01	0.600 11	0.7734 1D-01
0.10D 01	0.34556D 00	0.60D 04	0.14043D 00	0.200 08	,0.95578D-01	0.70D 11	0.77373D-01
0.200 01	0.31080D 00	0.70D 04	0.13894D 00	0.30D 08	0.95394D-01	0.80D 11	0.76981D-01
0.30D 01	0.29334D 00	0.80D 04	0.13768D 00	0.400 08	0.95315D-01	0.900 11	0.766340-01
0.40D 01	0.262030 00	0.90D 04	0.13658D 00	0.50D 08	0.95260D-01		
0.50D 01	0.273610 00	0.100 05	0.13562D 00	0.60D 08	0.952 13D-01		
0.600 01	0.267430 00	0.200 05	0.12959D 00	0.700 08	0.951680-01		
0.700 01	0.262250 00	0.300 05	0.126310 00	0.500 08	0.951 23D-01		
0.80D 01	0.257910 00	0.400 05	0.124080 00	0.90D 08	0.95079D-01		
C.900 01	0.254200 00	0.50D 05	0.122410 00	0.100 09	0.950369-01		
0.100 02	0.25096D 00	0.60D 05	0.12107D 00	0.200 09	0.94612D-01		
0.20D 02	0.23151D 00	0.700 05	0.119370 00	0.300 09	0.9421 0D-01		
0.300 02	0.22142D 00	0.800 05	0.11903D 00	0.40D 09	0.93828D-01		
0.400 02	0.21476D 00	0.900 05	0.11822D 00	0.500 09	0.934660-01		
0.50D 02	0.20986D 00	0.100 06	0.11750D 00	0.600 09	0.93122D-01		

q_D FOR DIFFERENT r_{eD} VALUES ($\omega = 0.1$, $\lambda = 10^{-5}$)

t_D	10	.20	50	100	200
0.1 CD-01	0.22488D 01	0.224880 01	0.224880 01	0.22488D 01	0.22488D 01
0.20D-01	0.171520 01	0.171520 01	0.171520 01	0.171520 01	0.17152D 01
0.30D-01	0.14763D 01	0.147630 01	0.147639 01	0.147630 01	0.14763D C1
0.400-01	0.133250 01	0.133250 01	0.13325D 01	0.133250 01	0.13325D 01
0.50D-01	0.123360 01	0.123360 01	0.123360 01	0.123360 01	0.12336D 01
0.60D-01	0.116000 01	0.11600D 01	0.116000 01	0.116009 01	0.11600D 01
0.700-01	0.110250 01	0.11025D 01	0.11025D 01	0.110250 01	0.11025D 01
0.80D-01	0.10558D 01	0.10558D 01	0.105580 01	0.105583 01	0.10558D 01
0.900-01	0.101690 01	0.10169D 01	0.101690 01	0.10169D 01	0.10169D 01
0.10D 00	0.983780 00	0.983760 C0	0.983561) 00	0.983780 00	0.98378D 00
0.200 00	0.800590 00	0.800590 00	0.800590 00	0.800590 00	0.80059D 0C
0.300 00	0.716210 00	0.716210 00	0.716210 00	0.71621D 00	0.71621D 00
0.403 C0	0.664410 00	0.66441D 00	0.664410 00	0.664410 00	0.66441D 00
0.500 00	0.628190 00	0.628190 00	0.628190 00	0.628190 00	0.62819D 00
0.600 00	0.600900 00	0.60090D 00	0.600900 00	0.600900 00	0.60090D 00
0.700 00	0.579290 00	0.579290 00	0.579230 00	0.579290 00	0.57929D 00
0.800 30	0.561590 00	0.561590 00	0.561590 00	0.561590 00	0.56159D 00
0.900 00	0.546700 00	0.546700 00	0.546700 00	0.54670D 00	0.54670D 00
0.10D 01	0.53394D 00	0.533940 00	0.533940 00	0.533940 00	0.53394D 00
0.200 01	0.461170 00	0.461170 00	0.46117D 00	0.461170 00	0.46117D 00
0.300 01	0.426140 00	0.426140 0G	0.42614D 00	0.42614D 00	0.42614D 00
0.480 01	0.354730 00	0.404020 00	0.404020 00	0.404020 00	0.40402D 00
0.500 01	0.314133 00	0.388240 00	0.388240 00	0.338240 00	0.38824D 00
0.600 01	0.278190 00	0.376140 00	0.37614D 00	0.37614D 00	0.37614D 00
0.700 01	0.246375 00	0.366430 00	0.366430 00	0.366430 00	0.36643D 00
0.800 01	0.218200 00	0.35839D 00	0.35839D 00	0.358390 00	0.35839D 00
0.930 01	0.193250 00	0.351560 00	0.351560 00	0.351560 00	0.35156D 00
0.100 02	0.171170 00	0.345640 00	0.34564D 00	0.345640 00	0.34564D 00
0.20D 02	0.510330-01	0.27300D 00	0.310930 00	0.310930 00	0.31093D 00
0.300 02	0.1546 DD-01	0.220060 00	0.293520 00	0.293520 00	0.29352D 00
0.400 02	0.491 96D-02	0.177470 00	0.28225D 00	0.282250 00	0.28225D 00
0.50D 02	0.180290-02	0.14320D 00	0.274073 00	0.274070 00	0.27407D C0
0.600 02	0.88687D-03	0.115620 00	0.267720 00	0.26772D 0il	0.26772D 00
0.733 02	0.616910-03	0.93422D-01	0.26257D 00	0.262570 00	0.26257D 00
0.80D 02	0.53686D-03	0.75563D-01	0.25205D 00	0.258270 00	0.25827D 00
0.900 02	0.51224D-03	0.611930-01	0.24582D 00	0.254580 00	0.25458D 00
C.10D 03	0.50107D-03	0.496290-01	0.239790 00	0.251360 00	0.25130D C0
0.290 03	0.491230-03	0.74025D-02	0.187740 00	0.232200 00	0.23220D 00
0.303 03	0.494380-03	0.259770-02	0.14760D 00	0.222353 00	0.22235D 00
0.40D 03	0.493400-03	0.205670-02	0.116630 00	0.203450 00	0.21592D 00
0.50D 03	0.49230D-03	0.199100-02	0.92732D-01	0.19851D 00	0.21123D 00
0.600 03	0.491460-03	0.197653-02	0.742890-01	0.189180 00	0.20759D 00
0.70D 03	0.49081D-03	0.19697D-02	0.60057D-01	0.180470 00	0.20464D 00
0.80D 03	0.49023D-03	0.196610-02	0.490720-01	0.17216D 00	0.20218D 00
0.930 03	0.48966D-03	0.19642D-02	0.405950-01	0.16441D 00	0.20008D 00
0.100 04	0.48915D-03	0.19631D-02	0.340510-01	0.157110 00	0.19826D 00
0.20D 04	0.48332D-03	0.194540-02	0.13508D-01	0.10413D 00	0.17943D 00
0.30D 04	0.47849D-03	0.192330-02	0.118620-01	0.753970-01	0.16530D 00
0.40D 04	0.47321D-03	0.1901 90-02	0.116250-01	0.59667D-01	0.15379D 00
0.50D 04	0.467990-03	0.1881 OD-02	0.11489D-01	0.509920-01	0.14438D 00
0.600 04	0.462620-03	0.18603D-02	0.11363D-01	0.461300-01	0.13668D 00
0.700 04	0.457710-03	0.183990-02	0.11 2410-01	0.433300-01	0.13035D 00
0.80D 04	0.452650-03	0.18196D-02	0.111230-01	0.41646D-01	0.12513D 00
0.90D 04	0.44766D-03	0.179963-02	0.11005D-01	0.40569D-01	0.12080D 00
0.100 05	0.44271D-03	0.17798D-02	0.10889D-01	0.39820D-01	0.11720D 00
0.200 05	0.390 19D-03	0.15935D-02	0.978640-02	0.358610-01	0.10030D 00
0.30D 05	0.35456D-03	0.142650-02	0.87942D-02	0.326920-01	0.93518D-01
0.40D C5	0.31730D-03	0.12772D-02	0.79028D-02	0.29793D-01	0.88190D-01
0.500 05	0.28396D-03	0.114350-02	0.71 0180-02	0.27150D-01	0.832830-01
0.600 05	0.254120-03	0.10237D-02	0.63820D-02	0.24741 0-01	0.786640-01
0.700 05	0.22742D-03	0.9 16540-03	0.573510-02	0.225460-01	0.743040-01
0.800 05	0.203520-03	0.820570-03	0.515580-02	0.20546D-01	0.701 690-01
0.90D 05	0.1821 30-03	0.73464D-03	0.463150-02	0.187230-01	0.663040-01
0.10D 06	0.16299D-03	0.657710-03	0.416230-02	0.17062D-01	0.626350-01
0.200 06	0.53705D-04	0.217600-03	0.142950-02	0.673950-02	0.35485D-01
0.300 06	0.176940-04	0.71 989D-04	0.491010-03	0.266290-02	0.20129D-01
0.40D C6	0.582470-35	0.237960-04	0.168530-03	0.105220-02	0.1 1427D-01
0.50D 06	0.191530-05	0.785700-05	0.57781D-04	0.415450-03	0.648990-02
0.600 06	0.63251D-06	0.260460-05	0.198550-04	0.163950-03	0.366650-02
0.70D 06	0.21410D-06	0.88440D-06	0.69382D-05	0.64906D-04	0.209400-02
0.630 06	0.77499D-07	0.320600-06	0.254910-05	0.26052D-04	0.11890D-02
0.920 06	0.31408D-07	0.12988D-06	0.10303D-05	0.105420-04	0.6 7500D-03
0.100 07	0.13887D-07	0.57547D-07	0.459960-06	0.481 55D-05	0.38321D-03

q_D FOR DIFFERENT r_{eD} VALUES

t_D	r_{eD} 10,000	4,000	2,000	1,000	500
0.1 00-01	0.22408D 01	0.22488D 01	0.22488D 01	0.224680 C1	0.22488D 01
0.20D-01	0.17152D 01	0.171520 01	0.171520 01	0.171525 01	0.17152D 01
0.30D-01	0.147610 01	0.147630 01	0.14763D 01	0.147630 01	0.14763D 01
0.40D-01	0.133259 01	0.133250 01	0.133250 01	0.133253 01	0.13325D 01
0.50D-01	0.123360 01	0.123361: 01	0.123340 01	0.123360 01	0.12336D 01
0.60D-01	0.11600D 01	0.11600D 01	0.116000 01	0.116000 01	0.11600D 01
0.70D-01	0.11025D 01	0.110250 01	0.11025D 01	0.110250 01	0.11025D 01
0.80D-01	0.105580 01	0.10558D 01	0.10558D 01	0.10558D 01	0.10558D 01
0.90D-01	0.1016510 01	0.101690 01	0.101690 01	0.10169D 01	0.101690 01
0.109 00	0.98378D 00	0.98378D 00	0.98378D 00	0.963783 00	0.98378D 00
0.200 00	0.80059D 00	0.80059D 00	0.800590 00	0.800590 00	0.800590 00
0.300 00	0.716210 03	0.716210 00	0.71621D 00	0.716210 00	0.71621D 00
0.400 00	0.66441D 00	0.664410 00	0.664410 00	0.664410 C0	0.664410 C0
0.500 00	0.628193 00	0.628193 G0	0.62819D 00	0.628190 00	0.628190 00
0.600 00	0.600930 00	0.600905 00	0.600930 00	0.600900 00	0.60090D 00
0.700 00	0.57929D 00	0.579290 00	0.579295 00	0.57929D 00	0.57929D 00
0.80D 00	0.561550 00	0.56159D 00	0.561590 00	0.56159D 00	0.561550 00
0.90D 00	0.546703 00	0.546702 00	0.546700 00	0.546700 00	0.54670D 00
0.10D 01	0.533940 00	0.53394D 00	0.533940 00	0.533940 00	0.533940 00
0.200 01	0.461170 00	0.46117D 00	0.46117D G0	0.46117D 00	0.46117D 00
0.30D 01	0.425140 00	0.426143 00	0.426140 00	0.426140 G0	0.426140 00
0.400 01	0.404020 00	0.404020 01	0.404020 00	0.40402D 00	0.40402D 00
0.500 01	0.388240 00	0.388240 00	0.383240 00	0.38824D 00	0.38824D 00
0.603 01	0.37614D 00	0.376140 00	0.37614D 00	0.376140 00	0.376140 00
0.700 01	0.36643D 00	0.366430 00	0.36643D 00	0.366430 00	0.366430 00
0.80D 01	0.359393 00	0.359330 00	0.358393 00	0.358390 00	0.358393 00
0.900 01	0.35156D 00	0.35156D 00	0.351530 00	0.351560 00	0.351560 00
0.10D 02	0.345643 00	0.345640 00	0.34564D 00	0.345640 00	0.34564D 00
0.20D 02	0.31093D 00	0.31093D 00	0.310933 00'	0.310930 00	0.31093D 00
0.300 02	0.29352D 00	0.29352D 00	0.293520 00	0.293520 00	0.293520 00
0.400 02	0.282250 00	0.28225D 00	0.28225D 00	0.282250 00	0.28225D 01
0.50D 02	0.274073 00	0.274070 00	0.274073 00	0.274070 00	0.27407D 04
0.60D 32	0.26772D 00	0.26772D C0	0.26772D 00	0.26772D 00	0.267720 00
0.70D 02	0.262570 00	0.262573 00	0.262573 00	0.26257D 00	0.26257D 00
0.80D 02	0.258273 00	0.256270 00	0.25827D 00	0.258270 00	0.258270 00
0.900 02	0.254580 00	0.25458D 00	0.25458D 00	0.254580 00	0.254580 00
0.10D 03	0.25138D 00	0.251380 00	0.251369 00	0.25138D 00	0.251380 00
0.200 03	0.232203 00	0.23220D 00	0.232200 00	0.232200 00	0.232200 00
0.300 03	0.22235D 00	0.222350 00	0.222353 00	0.22235D 00	0.222350 00
0.400 03	0.215920 00	0.21592D 00	0.215920 OC	0.215920 00	0.215923 00
0.500 03	0.211230 00	0.21123D 00	0.211230 00	0.211230 00	0.211230 OC
0.600 03	0.207590 00	0.207593 00	0.207590 00	0.207590 00	0.207590 00
0.700 03	0.204640 00	0.204640 00	0.204643 00	0.204640 00	0.204640 00
0.80D 03	0.20218D 00	0.202160 00	0.20218D 00	0.202130 00	0.202180 00
0.900 03	0.20008D 00	0.20003D 00	0.200060 00	0.200020 00	0.20008D 00
0.10D 04	0.19826D 00	0.19826D C0	0.19826D 00	0.19826D 00	0.196263 00
0.20D 04	0.187620 00	0.187620 00	0.18762D 00	0.187620 00	0.187620 00
0.300 04	0.182500 00	0.182500 03	0.182500 00	0.182500 00	0.182500 00
0.400 04	0.179370 00	0.17937D 00	0.179370 00	0.179370 00	0.179373 00
0.500 04	0.17724D 01	0.177240 00	0.177240 00	0.177240 00	0.17724D 00
0.600 04	0.175600 00	0.175690 00	0.175670 00	0.175690 00	0.17569D 00
0.70D 04	0.174510 00	0.174510 C0	0.174510 00	0.174510 00	0.174510 00
0.80D 04	0.17358D 00	0.17358D 00	0.173580 00	0.173533 00	0.172570 00
0.90D 04	0.172820 00	0.17282D 00	0.172820 00	0.172820 00	0.171440 00
0.10D 05	0.172190 00	0.172190 00	0.172190 00	0.172193 00	0.17042D 00
0.20D 05	0.16892D 00	0.169920 00	0.16892D 00	0.168920 00	0.163640 00
0.300 05	0.167250 00	0.16723D 00	0.167230 00	0.167233 00	0.160200 00
0.40D 05	0.16586D 00	0.165860 PO	0.16586D 00	0.165640 00	0.15745D 00
0.50D 05	0.164620 00	0.164620 C0	0.164620 00	0.16431D 00	0.155030 00
0.600 05	0.163460 00	0.163460 C0	0.163463 00	0.163070 00	0.15268D 00
0.700 05	0.16237D 00	0.162370 00	0.16237D 00	0.16190D 00	0.150431) C0
0.80D 05	0.161350 00	0.161350 00	0.161350 00	0.160790 00	0.14825D 00
0.900 05	0.160370 00	0.160370 00	0.16037D 00	0.15972D 00	0.146120 00
0.100 06	0.15946D 00	0.159460 00	0.159450 00	0.15871D 00	0.14404D 00
0.20D 06	0.152460 00	0.152460 00	0.152450 00	0.15044D 00	0.125380 00
0.300 06	0.147980 00	0.14798D 00	0.147950 00	0.144260 00	0.109650 00
0.400 06	0.14484D 00	0.144840 00	0.144770 00	0.13908D 00	0.96157D-01
0.500 06	0.142470 00	0.14249D 00	0.142360 00	0.134430 00	0.84370D-01
0.600 06	0.140630 00	0.140630 G0	0.14041D 00	0.13010D 00	0.74055D-01
0.730 06	0.139110 00	0.139110 00	0.138750 00	0.12598D 00	0.65011D-01
0.80D 06	0.137810 00	0.137810 00	0.137300 00	0.122030 00	0.57076D-01
0.900 06	0.136700 00	0.136700 00	0.135990 00	0.118230 00	0.50110D-01
0.10D 07	0.135730 30	0.135710 G0	0.134770 00	0.114550 00	0.43995D-01

t_D	10,000	4,000	2,000	1,000	500
0.200 07	0.129520 00	0.12959D 00	0.124830 00	0.83570D-01	0.11974D-01
0.300 07	0.12631D 00	0.126160 00	0.11607D 00	0.60974D-01	0.32578D-02
0.400 07	0.124060 00	0.123600 00	0.107970 G0	0.44487D-01	0.88489D-03
0.50D 07	0.12233D 00	0.121330 00	0.10044D 00	0.32453D-01	0.24099D-03
0.60D 07	0.12104D 00	0.11932D 00	0.93428D-01	0.23682D-01	0.67584D-04
0.700 07	0.11992D 00	0.11734D 00	0.869090-01	0.17279D-01	0.20627D-04
0.800 07	0.11898D 00	0.115410 00	0.80845D-01	0.12607D-01	0.74995D-05
0.900 07	0.118150 00	0.113510 00	0.752050-01	0.91982D-02	0.28665D-05
0.100 08	0.117430 00	0.111650 00	0.69957D-01	0.57110D-02	0.66912D-06
0.20D 08	0.112750 00	0.94666D-01	0.33941D-01	0.28611D-03	
0.30D 08	0.109750 00	0.80263D-01	0.164670-01	0.15165D-04	
0.400 08	0.107110 00	0.68052D-01	0.79893D-02	0.11873D-05	
0.500 08	0.104600 00	0.57698D-01	0.38755D-02		
0.600 08	0.10216D 00	0.48920D-01	0.18790D-02		
0.70D 08	0.997760-01	0.414770-01	0.910480-03		
0.800 08	0.97450D-01	0.351660-01	0.441230-03		
0.900 08	0.951790-01	0.29816D-01	0.21438D-03		
0.100 09	0.929600-01	0.25280D-01	0.10503D-03		
0.200 09	0.73428D-01	0.48529D-02			
0.300 09	0.580300-01	0.92991D-03			
0.400 09	0.458130-01	0.17864D-03			
0.50D 09	0.361870-01	0.36297D-04			
0.600 09	0.28584D-01	0.89508D-05			
0.700 09	0.225780-01	0.26450D-05			
0.800 09	0.17834D-01	0.35429D-06			
0.900 09	0.14087D-01				
0.100 10	0.111270-01				
0.200 10	0.105960-02				
0.300 10	0.999539-04				
0.400 10	0.11587D-04				
0.500 10	0.19581D-05				

$r_{eD} = \infty$

t_D	q_D	t_D	q_D	t_D	q_D
0.10D-01	0.224880 01	0.300 03	0.22235D 00	0.500 07	0.12238D 00
0.20D-01	0.171520 01	0.40D 03	0.215923 00	0.600 07	0.12104D 00
0.30D-01	0.14763D 01	0.50D 03	0.211230 00	0.700 07	0.11992D 00
0.40D-01	0.13325D 01	0.600 03	0.207550 00	0.80D 07	0.11898D 00
0.50D-01	0.123360 01	0.700 03	0.20464D 00	0.90D 07	0.11815D 00
0.600-01	0.116000 01	0.80D 03	0.202180 00	0.100 08	0.11743D 00
0.70D-01	0.110250 01	0.900 03	0.200060 00	0.200 08	0.11286D 00
0.800-01	0.105580 01	0.10D 04	0.198260 00	0.300 08	0.11035D 00
0.900-01	0.101690 01	0.200 04	0.167620 00	0.400 08	0.10863D 00
0.10D 00	0.963760 00	0.30D 04	0.182500 00	0.500 08	0.10734D 00
0.200 00	0.80059D 00	0.400 04	0.179370 00	0.605 OS	0.10631D 00
0.300 03	0.71621D 03	0.50D 04	0.17724D 00	0.700 08	0.10545D 00
0.400 00	0.66441D 00	0.600 04	0.175690 00	0.800 08	0.10471D 00
0.500 00	0.628190 00	0.700 04	0.174510 00	0.900 08	0.10407D 00
0.60D 00	0.60090D 00	0.800 04	0.173580 00	0.100 09	0.10351D 00
0.700 00	0.57929D 00	0.90D 04	0.172820 00	0.200 09	0.99942D-01
0.600 00	0.561550 00	0.10D 05	0.172190 00	0.300 09	0.97966D-01
0.900 00	0.545700 00	0.200 05	0.168920 00	0.400 09	0.96611D-01
0.100 01	0.533943 00	0.300 05	0.167230 00	0.500 09	0.95585D-01
0.20D 01	0.461170 00	0.400 05	0.165860 00	0.600 09	0.94763D-01
0.300 01	0.42614D 00	0.503 05	0.164620 00	0.700 09	0.940790-01
0.40D 01	0.404020 00	0.600 05	0.163460 00	0.800 09	0.934940-01
0.500 01	0.38824D 00	0.700 05	0.162370 00	0.90D 09	0.92984D-01
0.500 01	0.376140 00	0.80D 05	0.16135D 00	0.100 10	0.92533D-01
0.700 01	0.366430 00	0.930 05	0.160370 00	0.200 10	0.89668D-01
0.800 01	0.353350 00	0.100 06	0.159463 00	0.30D 10	0.890730-t 1
0.900 01	0.351550 00	0.200 06	0.152460 00	0.400 10	0.86975D-01
0.100 02	0.345640 00	0.300 06	0.147983 00	0.500 10	0.861420-01
0.200 02	0.310930 00	0.403 06	0.144840 00	0.600 10	0.854730-01
C.300 02	0.293520 00	0.50D 06	0.14249D 00	0.700 10	0.849160-01
0.400 02	0.282250 00	0.600 06	0.140630 00	0.600 10	0.84439D-01
0.500 02	0.274070 00	0.700 06	0.139110 00	0.900 10	0.84022D-01
0.600 02	0.267720 00	0.80D 06	0.137810 00	0.10D 11	0.836530-01
0.700 02	0.262570 00	0.90D 06	0.136700 00	0.200 11	0.813040-01
0.80D 02	0.258270 00	0.100 07	0.13571D 00	0.300 11	0.799890-01
0.500 02	0.25458D 00	0.200 07	0.129620 00	0.400 11	0.79082D-01
0.100 03	0.25138D 00	0.300 07	0.126310 00	0.500 11	0.78392D-01
0.20D 03	0.232200 00	0.400 07	0.124060 00	0.630 11	0.77837D-01

q_D FOR DIFFERENT VALUES OF r_{eD} ($\omega = 0.1$, $\lambda = 10^{-4}$)

t_D	r_{eD} = 10	20	50	100	200
0.1 00-01	0.22488D 01	0.224880 01	0.224680 01	0.224800 01	0.224880 01
0.20D-01	0.171520 01	0.171520 01	0.171520 01	0.171520 01	0.17152D 01
0.300-01	0.147630 01	0.147630 01	0.147630 01	0.147630 01	0.14763D 01
0.40D-01	0.133250 01	0.133251) 01	0.133250 01	0.133250 01	0.13325D 01
0.50D-01	0.123360 01	0.123360 01	0.123360 01	0.123365 01	0.12336D 01
0.60D-01	0.'1601D 01	0.116010 01	0.116010 01	0.116010 01	0.116010 01
0.70D-01	0.110250 01	0.110250 01	0.11025D 01	0.110250 01	0.110250 01
0.830-01	0.105550 01	0.105590 01	0.105580 01	0.105580 01	0.105580 01
0.90D-01	0.101690 01	0.101690 01	0.101690 01	0.101690 01	0.101690 01
0.100 00	0.983330 0G	0.983830 00	0.963830 00	0.98383D 00	0.983830 00
0.200 00	0.803670 00	0.300670 00	0.800670 00	0.80067D 00	0.300670 00
0.300 00	0.71630D 00	0.716300 00	0.716300 00	0.716300 00	0.716300 00
0.40D 00	0.664520 00	0.664520 00	0.664520 00	0.66452D 00	0.56452D 00
0.500 00	0.628320 00	0.628320 00	0.628520 00	0.628320 00	0.62832D 00
0.603 00	0.601040 00	0.601040 00	0.601040 00	0.601040 00	0.601050 00
0.700 00	0.579451) 00	0.579450 00	0.579450 00	0.579450 00	0.57945D 00
C.800 00	0.561750 00	0.561750 00	0.561750 00	0.561759 00	0.561750 00
0.900 00	0.546680 00	0.546880 00	0.546883 00	0.546880 00	0.546880 00
0.100 01	0.534120 00	0.534120 00	0.534120 00	0.534120 00	0.534120 00
0.200 01	0.461450 00	0.461453 00	0.461450 00	0.461450 00	0.461450 00
0.30D 01	0.426500 00	0.426500 00	0.426500 00	0.426500 00	0.426500 00
0.400 01	0.355280 00	0.404450 00	0.404450 00	0.404450 00	0.40445D 00
0.500 01	0.314850 00	0.388720 C0	0.388720 00	0.388720 00	0.388723 00
0.600 01	0.279080 00	0.376690 00	0.376690 00	0.376690 00	0.376690 00
0.70D 01	0.247450 00	0.367040 00	0.367040 00	0.367040 00	0.367040 00
0.800 01	0.219461) 00	0.359050 00	0.359050 00	0.359350 00	0.35905D 00
0.900 01	0.194713 00	0.352270 00	0.352270 00	0.352270 00	0.352270 00
0.100 02	0.172810 00	0.346400 00	0.346400 00	0.34640D 00	0.346400 00
0.200 02	0.541860-01	0.274690 00	0.312139 00	0.312130 00	0.31213D 00
0.303 02	0.193630-01	0.222910 00	0.295100 00	0.295100 00	0.295100 00
0.40D 02	0.91 3490-02	0.181630 00	0.284170 00	0.284170 00	0.28417D 00
0.500 02	0.6 1344D-02	0.1487013 00	0.276311) 00	0.276310 00	0.276310 00
0.600 02	0.52569D-02	0.'2244D 00	0.270270 00	0.270270 00	0.270270 00
0.700 02	0.49988D-02	0.101500 00	0.265410 00	0.265410 00	0.26541D C0
0.800 02	0.49184D-02	0.34792D-01	0.255500 00	0.261330 00	0.261360 00
0.90D 02	0.48881D-02	0.714660-01	0.249750 00	0.257950 00	0.257950 00
0.100 03	0.467210-02	0.608350-01	0.244175 00	0.255020 00	0.255020 00
0.203 03	0.481020-02	0.232000-01	0.19852D 00	0.238090 00	0.236090 00
0.303 03	0.476100-02	0.191 130-01	0.166230 03	0.230110 00	0.23011D 00
0.40D 03	0.47084D-02	0.18518D-01	0.143329 00	0.219600 00	0.225310 00
0.50D 03	0.465520-02	0.182760-01	0.127010 00	0.212520 00	0.222060 00
0.600 03	0.460450-02	0.180760-01	0.115340 00	0.206960 00	0.219710 00
0.703 03	0.455430-02	0.178810-01	0.106930 00	0.201870 00	0.217920 00
0.80D 03	0.450430-02	01 76910-01	0.100810 00	0.197420 00	0.216520 00
0.930 03	0.445500-02	0.175050-01	0.96 313D-01	0.193540 00	0.215360 00
0.100 04	0.440610-02	0.17321 D-01	0.929430-01	0.190130 00	0.214443 00
0.200 04	0.394630-02	0.155770-01	0.80215D-01	0.17099D 00	0.20733 00
0.303 04	0.353440-02	0.140050-01	0.739480-01	0.16222D 00	0.202993 00
0.400 04	0.316540-02	0.12593D-01	0.683150-01	0.155760 00	0.19985D 00
0.500 04	0.28350D-02	0.113230-01	0.631180-01	0.149950 00	0.197050 00
0.600 04	0.253910-02	0.10181D-01	0.5831 9D-01	0.144450 00	0.194410 00
0.700 04	0.227410-02	0.91543D-02	0.53887D-01	0.139180 00	0.19189D 00
0.800 04	0.203670- 02	0.82311D-02	0.497920-01	0.134120 00	0.159430 00
0.900 04	0.182410-02	0.740 1C0 -02	0.46008D-01	0.129250 00	0.18706D 00
0.130 05	0.163370-02	0.665470-02	0.425130-01	0.124570 00	0.184750 00
0.20D 05	0.54252D-03	0.22988D-02	0.19304D-01	0.863360-01	0.16459D 00
0.30D 05	0.180150-03	0.794110-03	0.877450-02	0.601160-01	0.147920 00
0.400 05	0.597720-04	0.274150-03	0.3991 3D-02	0.419050-01	0.133440 00
0.50D 05	0.198090-04	0.94540D-04	01 8159D-02	0.292360-01	0.12057D 00
0.600 05	0.659020-05	0.32667D-04	0.825960-03	0.20405D-01	0.10902D 00
0.700 05	0.224380-05	0.114690-04	0.375640-03	0.142451)-01	0.98602D-01
0.80D 05	0.81426D-06	0.422530-05	0.171180-03	0.99456D-02	0.891 92D-01
0.900 05	0.329670-06	0.170621)-05	0.78586D-04	0.694380-02	0.80684D-01
0.100 06	0.14648D-06	0.763640-06	0.36757D-04	0.48478D-02	0.729893-01
0.200 06				0.134420-03	0.26795D-01
0.300 06				0.627740-05	0.98373D-02
C.40D 06					0.36100D-02
0.50D 06					0.132330-02
0.600 06					0.48519D-03
0.700 06					0.179360-03
0.800 06					0.68242D-04
0.900 06					0.27685D-04
0.10D 07					0.12346D-04

q_D FOR DIFFERENT VALUES OF r_{eD}

t_D	r_{eD} 500	1,000	2,000	4,000	10,000
0.109-01	0.224880 01	0.224880 01	0.224880 01	0.224800 01	0.22488D 01
0.200-01	0.171520 01	0.171520 01	0.171520 01	0.171520 01	0.171520 01
0.3CO-01	0.14763D 01	0.147630 01	0.147630 01	0. 47630 01	0.147620 01
0.4CD-01	0.133253 01	0.133250 01	0.133250 01	0. 33250 01	0.133250 01
0.5DD-01	0.123360 01	0.123360 01	0.123360 01	0. 23360 01	0.123360 01
0.600-C1	0.116010 01	0.116010 01	0.116010 01	0. 16010 01	0.116010 01
0.700-01	0.110250 01	0.110250 01	0.110250 01	0. 1025D 01	0.11025D 01
0.800-01	0.105580 01	0.105580 01	0.105580 01	0. 05580 01	0.105580 01
0.900-01	0.101690 01	0.101690 01	0.101690 01	0. 0169D 01	0.101690 01
0.100 00	0.983830 00	0.983830 00	0.983830 00	0. 83830 00	0.983230 00
0.200 00	0.800670 00	0.800670 00	0.800670 00	0.800670 00	0.80067D 00
0.300 00	0.716300 00	0.716300 00	0.71630D 00	0.71630D 00	0.716300 00
0.400 00	0.664520 00	0.664520 00	0.664520 00	0.664520 00	0.664520 00
0.500 00	0.628320 00	0.628320 00	0.62832D 00	0.628320 00	0.62832D 00
0.600 00	0.601040 00	0.60104D 00	0.601040 00	0.601040 00	0.601040 00
0.700 00	0.579450 00	0.579450 00	0.579450 00	0.579450 00	0.579455 00
0.800 00	0.561750 00	0.561750 00	0.561750 00	0.561750 00	0.541750 00
0.90D 00	0.546820 00	0.546850 00	0.546860 00	0.54686D 00	0.54686D 00
0.100 01	0.534120 00	0.534120 00	0.534120 00	0.534120 00	0.534120 00
0.200 01	0.461450 00	0.461450 00	0.461450 00	0.461450 00	0.461450 00
0.300 01	0.42650D 00	0.426500 00	0.426500 00	0.426500 00	0.426500 00
0.400 01	0.404450 00	0.404450 00	0.404450 00	0.404450 C0	0.404450 00
0.500 01	0.38872D 00	0.388720 00	0.388720 00	0.388720 00	0.388720 00
0.600 01	0.376600 00	0.376690 00	0.37669D 00	0.376690 00	0.376690 00
0.700 01	0.367040 00	0.367040 00	0.367040 00	0.367040 00	0.367040 00
0.80D 01	0.35905D 00	0.359050 00	0.359050 00	0.359050 00	0.359650 00
0.900 01	0.35227D 00	0.352270 00	0.35227D 00	0.352270 00	0.352270 00
0.100 02	0.34640D 00	0.346400 00	0.34640D 00	0.346400 00	0.346400 00
0.200 02	0.312130 00	0.312130 03	0.312130 00	0.31213D 00	0.312130 00
0.303 02	0.29510D 00	0.29510D 00	0.295100 00	0.295100 00	0.295100 00
0.400 02	0.28417D 00	0.28417D 00	0.284170 00	0.284170 00	0.284170 00
0.500 02	0.276310 00	0.276310 00	0.27631D 00	0.276310 00	0.276310 00
0.60D 02	0.270270 00	0.270275 00	0.270270 00	0.27027D 00	0.270270 00
0.700 02	0.26541D 00	0.265410 00	0.265410 00	0.265410 00	0.265410 00
0.803 02	0.261380 00	0.261350 00	0.261380 00	0.261350 00	0.261380 00
0.900 02	0.257760 00	0.257950 00	0.25796D 00	0.257360 00	0.257960 00
0.100 03	0.255020 00	0.25502D 00	0.255020 00	0.255020 00	0.255020 00
0.200 03	0.238099 00	0.238090 00	0.238093 00	0.23809D 00	0.238090 00
0.300 03	0.230110 00	0.230110 00	0.230110 00	0.230110 00	0.230110 00
0.400 03	0.225310 00	0.225319 00	0.225310 00	0.225310 00	0.225310 00
0.500 03	0.222060 00	0.222060 00	0.222060 00	0.22206D 00	0.222060 00
0.600 03	0.219710 00	0.219710 00	0.219710 00	0.219710 00	0.219710 00
0.700 03	0.217920 00	0.217920 00	0.217920 00	0.217920 00	0.217920 00
0.800 03	0.216520 00	0.216520 00	0.216520 00	0.216520 00	0.216520 00
0.900 03	0.215380 00	0.215380 00	0.21538D 00	'0.215380 00	0.215380 00
0.100 04	0.214440 00	0.214440 00	0.214440 00	0.214440 00	0.214443 00
0.200 04	0.209535 00	0.209530 00	0.209530 00	0.209530 00	0.209530 00
0.300 04	0.206950 00	0.206950 00	0.206950 00	0.206950 00	0.206950 00
0.400 04	0.204850 00	0.204860 00	0.204860 00	0.20486D 00	0.20486D 00
0.500 34	0.202960 00	0.202960 00	0.202960 00	0.20296D 00	0.202960 00
0.60D 04	0.201200 00	0.201200 00	0.20120D 00	0.201200 00	0.201203 00
0.700 04	0.199540 00	0.199540 00	0.199540 00	0.199540 00	0.199540 00
0.80D 04	0.197960 00	0.197980 00	0.19798D 00	0.197960 00	0.19798D 00
0.900 04	0.196430 00	0.196510 00	0.196510 00	0.196510 00	0.196510 00
0.10D 05	0.195080 00	0.195120 00	0.195120 00	0.195120 00	0.195120 00
0.20D 05	0.184460 00	0.184630 00	0.184630 00	0.184630 00	0.184630 00
0.300 05	0.177670 00	0.178040 00	0.17804D 00	0.17804D 00	0.178040 00
0.40D 05	0.172780 00	0.173490 00	0.173490 00	0.173490 00	0.173490 00
0.500 05	0.168940 00	0.170110 00	0.170113 00	0.17011D 00	0.170110 00
0.60D 05	0.165690 00	0.167460 00	0.167470 00	0.167470 00	0.167470 00
0.700 05	0.162810 00	0.16530D 00	0.16530D 00	0.165300 03	0.16530D 00
0.800 05	0.16017D 00	0.16347D 00	0.16348D 00	0.163450 00	0.163480 00
0.900 05	0.157670 00	0.161900 00	0.161910 00	0.161910 00	0.161910 00
0.160 06	0.155290 00	8.160520 00	0.160540 00	0.160540 00	0.160540 00
0.200 06	0.134260 00	0.151720 00	0.152050 00	0.15209D 00	0.152090 00
0.300 06	0.116240 00	0.146120 00	0.147570 00,	0.147570 00	0.147570 00
0.400 06	0.10067D 00	0.141300 00	0.144520 00	0.144530 00	0.144530 00
0.500 06	0.871700-01	0.136770 00	0.142230 00	0.142250 00	0.142255 00
0.600 06	0.754810-01	0.13242D 00	0.140400 00	0.14044D 00	0.140440 00
0.70D 06	0.653600-01	0.128210 00	0.138850 00	0.13895D 00	0.138950 00
0.80D 06	0.56596D-01	0.124140 00	0.137493 00	0.137683 00	0.137680 00
0.900 06	0.450070-01	0.120200 00	0.136260 00	0.136590 00	0.136590 00
0.100 07	0.424360-01	0.116380 00	0.135120 00	0.135620 G0	0.135320 G0

t_D	500	1,000	2,000	4,000	10,000
0.200 07	0.10057D-01	0.862853-01	0.125350 00	0.12957D 00	0.129580 00
0.300 07	0.2381 70-02	0.61040D-01	0.116550 00	0.12619D 00	0.126280 00
0.40D 07	0.56308D-03	0.442050-01	0.10838D 00	0.123670 00	0.124050 00
0.50D 07	0.13484D-03	0.320 13D-01	0.10078D 00	0.121490 00	0.12237D 00
0.600 07	0.34776D-04	0.23164D-01	0.937080-01	0.11944D 00	0.12103D 00
0.703 07	0.106480-04	0.167900-01	0.87137D-01	0.117460 00	0.119910 00
0.80D 07	0.36882D-05	0.12160D-01	0.810260-01	0.11553D 00	0.11897D 00
0.900 07	0.82657D-06	0.88062D-02	0.753430-01	0.113633 00	0.11815D 00
0.10D OS		0.63773D-02	0.700593-01	0.11177D 00	0.11742D 00
0.200 08		0.252550-03	0.33860D-01	0.94742D-01	0.11276D 00
0.300 08		0.12989D-04	0.163650-01	0.803120-01	0.10976D 00
0.40D 08		0.80221D-06	0.79094D-02	0.68080D-01	0.107130 00
0.50D 08			0.38220D-02	0.57710D-01	0.10462D 00
0.60D 08			0.18460D-02	0.489200-01	0.1021;;) 00
0.70D 08			0.891010-03	0.41469D-01	0.997910-01
0.600 08			0.430150-03	0.35153D-01	0.974640-01
0.900 08			0.20825D-03	0.29799D-01	0.95191D-01
0.100 09			0.101710-03	0.25260D-01	0.929729-01
0.20D 09				0.48394D-02	0.73434D-01
0.30D 09				0.92548D-03	0.58003D-01
0.40D 09				0.17745D-03	0.45814D-01
0.500 09				0.360100-04	0.361 860-01
0.60D 09				0.88789D-05	0.28582D-01
C.70D 09				0.2621 7D-05	0.22575D-01
0.830 09				0.345490-06	0.17831D-01
0.90D 09					0.14084D-01
0.10D 10					0.11125D-01
0.20D 10					0.104930-02
0.30D 10					0.99645D-04
0.400 10					0.1 15650-04
0.500 10					0.195090-05

$r_{eD} = \infty$

t_D	q_D	t_D	q_D	t_D	q_D
0.10D-01	0.224990 01	0.100 03	0.25502D 00	0.100 07	0.135620 00
0.200-01	0.171520 01	0.200 03	0.238090 00	0.200 07	0.12958D 00
0.30D-01	0.147630 01	0.30D 03	0.230110 00	0.30D 07	0.126281) 00
0.400-01	0.133253 01	0.40D 03	0.225310 C0	C.400 07	0.1240513 00
0.500-01	0.123360 01	0.50D 03	0.22206D 00	0.500 07	0.122370 00
0.600-01	0.116010 01	0.600 03	0.21971D 00	0.600 07	0.121030 00
0.70D-01	0.11025D 01	0.700 03	0.217920 00	0.70D 07	0.119910 00
0.80D-01	0.105563 01	0.80D 03	0.21652D 00	0.80D 07	0.11897D 00
0.900-01	0.101693 01	0.90D 03	0.21538D 00	0.900 07	0.11815D 00
0.10D 00	0.98383D 00	0.10D 04	0.21444D 00	0.10D Oa	0.11742D 00
0.20D 00	0.80067D 00	0.200 04	0.209530 00	0.200 08	0.112860 00
0.300 00	0.716300 00	0.300 04	0.206950 00	0.300 08	0.110353 00
0.400 00	0.664520 00	0.40D 04	0.20486D 00	0.40D 08	0.108630 00
0.50D 00	0.628320 00	0.50D 04	0.202950 00	0.50D 08	0.107343 C0
0.600 00	0.601041) 00	0.600 04	0.201200 00	0.600 08	0.106310 00
0.700 00	0.579450 00	0.70D 04	0.19954D 00	0.700 08	0.10545D 00
0.80D 00	0.56175D 00	0.80D 04	0.19798D 00	0.800 08	0.104710 00
0.900 00	0.54668D 00	0.90D 04	0.196510 00	0.900 08	0.10407D 00
0.100 01	0.53412D 00	0.100 05	0.195120 00	0.10D 09	0.103510 00
0.20D 01	0.461450 00	0.200 05	0.184630 00	0.200 09	0.99942D-01
0.300 01	0.426500 00	0.300 05	0.178040 00	0.330 09	0.97966D-01
0.400 01	0.404450 00	0.400 05	0.17349D 00	0.40D 09	0.96611D-01
0.500 01	0.38872D 00	0.500 05	0.17011D 00	0.50D 09	0.95525D-01
0.600 01	0.37669D 00	0.60D 05	0.16747D 00	0.60D 09	0.94763D-01
0.700 01	0.36704D 00	0.70D 05	0.165300 00	0.700 09	0.94079D-01
0.800 01	0.35905D 00	0.800 05	0.16348D 00	0.800 09	0.93494D-01
0.90D 01	0.35227D 00	0.90D 05	0.161910 00	0.90D 09	0.92984D-01
0.10D 02	0.34640D 00	0.100 06	0.160540 00	0.100 10	0.92533D-01
0.20D 02	0.31213D 00	0.200 06	0.152090 00	0.20D 10	0.89668D-01
0.300 02	0.29510D 00	0.300 06	0.147570 00	0.30D 10	0.88073D-01
0.400 02	0.284170 00	0.400 06	0.144530 00	0.400 10	0.86975D-01
0.500 02	0.276310 00	0.500 06	0.14225D 00	0.500 10	0.86142D-01
0.600 02	0.270270 00	0.600 06	0.140443 00	0.609 10	0.85473D-01
0.700 02	0.265410 00	0.70D 06	0.13895D 00	0.70D 10	0.84916D-01
0.80D 02	0.26138D 00	0.80D 06	0.13768D 03	0.80D 10	0.84439D-01
0.900 02	0.257960 00	0.900 06	0.13659D 00	0.900 10	0.84022D-01
				0.10D 11	0.836533-01

q_D FOR DIFFERENT VALUES OF r_{eD} ($\omega = 0.001$, $\lambda = 10^{-4}$)

	r_{eD}				
t_D	10	20	50	100	200
0.10D-01	0.534120 00	0.534120 00	0.534120 00	0.534120 00	0.534120 00
0.20D-01	0.46145D 00	0.461450 00	0.461450 00	0.46145D 00	0.461450 00
0.30D-01	0.426500 00	0.426500 00	0.426500 00	0.426500 00	0.42650D 00
0.400-01	0.355280 00	0.404450 00	0.404450 00	0.404458 00	0.404450 00
0.560-01	0.31485D 00	0.38872D 00	0.38872D 00	0.358720 00	0.388720 00
0.600-01	0.27908D 00	0.376690 00	0.376690 00	0.376690 00	0.376690 00
0.700-01	0.247450 00	0.367040 00	0.36704D 00	0.367040 00	0.367045 00
0.800-01	0.219460 00	0.359050 00	0.359050 00	0.359050 00	0.359050 00
0.900-01	0.194710 00	0.352270 00	0.352270 00	0.352270 00	0.35227D 00
0.1CD 00	0.172610 00	0.346410 00	0.346410 00	0.346410 00	0.345410 00
0.200 00	0.54190D-01	0.274690 00	0.312140 00	0.312140 00	0.312140 00
0.300 00	0.193710-01	0.222920 00	0.295100 00	0.295100 00	0.295103 00
0.4CD 00	0.914820-02	0.181640 00	0.264180 00	0.284180 00	0.28418D 00
0.500 00	0.615290-02	0.148720 00	0.276320 00	0.276320 00	0.276320 00
0.600 00	0.528070-02	0.122470 00	0.270280 00	0.27028D 00	0.270230 00
0.700 00	0.5 02790-02	0.101539 00	0.26542D 00	0.265420 00	0.265420 00
0.800 0G	0.495280-02	0.846340-01	0.261400 00	0.255520 00	0.261400 00
0.900 00	0.492780-02	0.7151 9D-01	0.257990 00	0.249750 00	0.25799D 00
0.100 01	0.491 720-02	0.609010-01	0.255040 00	0.244220 00	0.255040 00
0.200 01	0.49081D-02	0.23433D-01	0.236170 00	0.198630 00	0.258170 00
0.300 01	0.491 120-02	0.19539D-01	0.23028D 00	0.166510 00	0.23028D 00
0.400 01	0.491 020-02	0.191 390-01	0.219880 00	0.143660 00	0.225570 00
0.500 01	0.490920-02	0.1 90930-01	0.213240 00	0.127880 00	0.222440 00
0.600 01	0.49085D-02	0.190310-01	0.207550 00	0.116610 00	0.220210 00
0.700 01	0.490790-02	0.190760-01	0.202660 00	0.106660 00	0.21856D 00
0.800 01	0.490730-02	0.190730-01	0.198460 00	0.103060 00	0.217310 00
0.9CD 01	0.49068D-02	0.190720-01	0.194850 00	0.991020-01	0.216333 00
0.100 02	0.49064D-02	0.190710-01	0.191740 00	0.963110-01	0.215553 00
0.2CD 02	0.490160-02	0.190560-01	0.176890 00	0.897850-01	0.210150 00
0.300 02	0.489670-02	0.1 90370-01	0.173570 00	0.89531D-01	0.20859D 00
0.400 02	0.489190-02	0.1901 9D-01	0.172800 00	0.89457D-01	0.203053 00
0.500 02	0.48870D-02	0.19001D-01	0.172560 00	0.893910-01	0.20765D 00
0.630 02	0.48822D-02	0.18983D-01	0.172490 00	0.893270-01	0.207760 00
0.70D 02	0.48773D-02	0.169640-01	0.172420 00	0.892630-01	0.207720 00
0.800 02	0.487250-02	0.189460-0 1	0.172350 00	0.89200D-01	0.207683 00
0.900 02	0.486760-02	0.18928D-01	0.172290 00	0.891360-01	0.207653 00
0.100 03	0.486260-02	0.1891 0D-01	0.17223D 00	0.890720-01	0.20762D 00
0.200 03	0.48147D-02	0.187300-01	0.171610 00	0.884330-01	0.20732D 00
0.309 03	0.47672D-02	0.185510-01	0.171003 00	0.877960-01	0.207020 03
0.400 03	0.472000-02	0.183740-01	0.170390 00	0.871 690-01	0.206720 00
0.500 03	0.46734D-02	0.181990-01	0.169790 00	0.86544D-01	0.20643D 00
0.600 03	0.462720-02	0.180260-01	0.169180 00	0.859230 -01	0.206130 00
0.700 03	0.45815D-02	0.17854D-01	0.166580 00	0.853070-01	0.205340 00
0.80D 03	0.453620-02	0.176640-01	0.167980 00	0.846950-0 1	0.205540 00
0.900 03	0.449140-02	0.175150-01	0.167390 00	0.84087D-01	0.205253 00
0.100 04	0.444700-02	0.173480-01	0.166790 00	0.83484D-01	0.204950 00
0.20D 04	0.402660-02	0.157630-01	0.160970 00	0.776870-01	0.20211D 00
0.300 04	0.364590-02	0.143230-01	0.155360 00	0.722930-01	0.199360 00
0.400 04	0.330120-02	0.1301 50-01	0.149960 00	0.67275D-01	0.196700 00
0.500 04	0.298910-02	0.118260-01	0.144770 00	0.62606D-01	0.19413D 03
0.600 04	0.270650-02	0.1 07460-01	0.139760 00	0.582620-01	0.191630 00
0.700 04	0.24506D-02	0.976440-02	0.134940 00	0.542200-01	0.189210 00
0.80D 04	0.221890-02	0.867240-02	0.130290 00	0.504590-01	0.18686D 00
0.9CD 04	0.200910-02	0.806200-02	0.125610 00	0.469600-0 1	0.18457D 00
0.100 05	0.181920-02	0.73256D-02	0.121490 00	0.43703D-01	0.182350 00
0.200 05	0.67383D-03	0.281100-02	0.659060-01	0.21 3140-01	0.162710 00
0.300 05	0.2496CD-03	0.107870-02	0.609440-01	0.104049-01	0.146390 00
0.400 05	0.924160-04	0.413840-03	0.433110-01	0.50822D-02	0.13222D 00
0.500 05	0.341800-04	0.158620-03	0.308080-01	0.24834D-02	0.119640 00
0.609 05	0.126440-04	0.60778D-04	0.219260-01	0.1 2134D-02	0.106340 00
0.700 05	0.471110-05	0.233950-04	0.156090-01	0.59271D-03	0.98150D-01
0.80D 05	0.180290-05	0.917700-05	0.11 1130-01	0.289600-03	0.889359-01
0.900 05	0.732730-0b	0.37701D-05	0.791 320-02	0.14185D-03	0.80593D-01
0.100 06	0.326570-06	0.167430-05	0.563440-02	0.700050-04	0.730350-01
0.20D 06			0.18898D-03		0.272940-01
0.300 06			0.920470-05		0.1 0201D-01
0.400 06			0.52381D-07		0.381 08D-02
0.500 06					0.142220-02
0.600 06					0.53072D-03
0.700 06					0.19936D-03
0.80D 06					0.767450-04
0.900 06					0.31263D-04
0.100 07					0.139060-04

q_D FOR DIFFERENT **VALUES** OF r_{eD}

t_D	r_{eD} = 500	**1,000**	2,000	*4,000*	10,000
0.10D-01	0.534120 00	0.534120 00	0.534120 00	0.5341211 00	0.53412D 00
0.20D-01	0.461450 00	0.461450 00	0.461450 00	0.461450 00	0.46145D 00
0.30D-01	0.4265013 00	0.426500 00	0.426500 00	0.426500 00	0.4265CD 00
0.400-01	0.404450 00	0.404450 00	0.404450 00	0.404450 00	0.40445D 00
0.500-01	0.388720 00	0.38872D 00	0.38872D 00	0.368720 00	0.38872D 00
0.600-01	0.37669D 00	0.376690 03	0.376690 00	0.376690 00	0.37669D 00
0.700-01	0.367040 00	0.367040 00	0.367040 00	0.367040 00	0.36704D 00
0.600-01	0.359050 00	0.359050 00	0.359050 00	0.359050 00	0.359050 00
0.90D-01	0.352270 00	0.352270 00	0.352270 00	0.35227D 00	0.35227D 00
0.10D 00	0.34641D 00	0.346410 00	0.346410 00	0.34641D 00	0.544410 00
0.20D 00	0.312140 00	0.31214D 00	0.31214D 00	0.312140 00	0.31214D 00
0.300 00	0.295100 00	0.295100 00	0.295100 00	0.295100 00	0.295100 00
0.400 00	0.28418D 00	0.28418D 00	0.28418D 00	0.284180 00	0.284180 00
0.500 00	0.276320 00	0.276320 00	0.276320 00	0.276320 00	0.276320 00
0.600 00	0.270280 00	0.27028D 00	0.27028D 00	0.27028D 00	0.27028D 00
0.70D 00	0.265420 00	0.265420 00	0.26542D 00	0.265420 00	0.265420 00
0.80D 00	0.261400 00	0.261403 00	0.261430 00	0.261400 00	0.261400 00
0.900 00	0.257990 00	0.257990 00	0.25799D 00	0.257990 00	0.25799D 00
0.10D 01	0.255040 00	0.255040 00	0.255040 00	0.255040 00	0.255040 00
0.20D 01	0.23817D 00	0.238170 00	0.238170 00	0.233170 00	0.238170 00
0.390 01	0.23028D 00	0.23028D 00	0.230280 00	0.23028D 00	0.23028D 00
0.400 01	0.225570 00	0.22557D 00	0.225570 00	0.225570 00	0.225570 00
0.500 01	0.222440 00	0.222440 00	0.22244D 00	0.222440 00	0.22244D 00
0.600 01	0.22021D 00	0.220210 00	0.22021D 00	0.220210 00	0.220210 00
0.700 01	0.21856D 00	0.218560 0D	0.218560 00	0.218560 00	0.218560 00
0.800 01	0.217310 00	0.217310 00	0.217310 00	0.21731D 00	0.217310 00
0.90D 01	0.21633D 00	0.216330 00	0.216330 00	0.216330 00	0.216330 00
0.100 02	0.215550 00	0.215550 00	0.215550 00	0.215550 00	0.215550 00
0.200 02	0.212500 00	0.212500 00	0.212500 00	0.212500 00	0.212550 00
0.300 02	0.211900 00	0.211900 00	0.211900 00	0.21190D 00	0.21190D 00
.0.40D 02	0.211740 00	0.211740 00	0.211740 00	0.211740 00	0.211740 00
0.5CD 02	0.211670 00'	0.211670 00	0.21167D 00	0.211670 00	0.21167D 00
0.600 02	0.211640 0D	0.211640 00	0.211640 00	0.211640 03	0.211640 00
0.70D 02	0.211620 00	0.211620 00	0.211620 00	0.21162D 00	0.211620 03
0.8CD 02	0.211590 00	0.211590 00	0.211590 00	0.211590 00	0.211593 00
0.900 02	0.211560 00	0.211570 00	0.211570 00	0.211570 00	0.21157D 00
0.100 03	0.211540 00	0.21155D 00	0.211550 00	0.211550 00	0.211550 0D
0.200 03	0.211320 00	0.211330 00	0.211330 00	0.21133D 00	0.211330 00
0.300 03	0.2111CD 00	0.21111D 00	0.211110 00	0.21111D 00	0.211110 00
0.40D 03	0.21088D 00	0.210690 00	0.210090 00	0.21089D 00	0.210890 00
0.500 03	0.210660 00	0.210670 00	0.210670 00	0.210670 00	0.210670 00
0.600 03	0.210440 00	0.210450 00	0.210450 00	0.210450 00	0.210450 00
0.700 03	0.210230 00	0.210240 00	0.210240 00	0.210240 00	0.21024D 00
0.80D 03	0.210010 00	0.210020 00	0.210020 00	0.210020 00	0.210020 00
0.900 03	0.20980D 00	0.209810 00	0.20981D 00	0.20981D 00	0.209810 00
0.100 04	0.209580 00	0.209600 00	0.209600 00	0.209500 00	0.209600 00
0.200 04	0.207530 00	0.207550 00	0.207550 00	0.207550 00	0.207550 00
0.300 04	0.205600 00	0.205620 00	0.205620 00	0.20562D 00	0.205620 00
0.400 04	0.203770 00	0.20380D 00	0.203800 00	0.203600 00	0.20380D 00
0.50D 04	0.202040 00	0.202060 00	0.20208D 00	0.20208D C0	0.20208D 00
0.600 04	0.200410 00	0.200450 00	0.200450 00	0.200450 00	0.200450 00
0.700 04	0.19886D 00	0.198910 00	0.198910 00	0.193910 00	0.19891D 00
0.800 04	0.19740D 00	0.197460 00	0.197460 00	0.197463 00	0.197460 00
0.900 04	0.196010 00	0.196080 00	0.196030 00	0.19608D 00	0.196030 00
0.10D 05	0.19469D 00	0.194770 00	0.194770 00	0.194770 00	0.19477D 00
0.200 05	0.184450 00	0.18469D 00	0.184690 00	0.18469D 00	0.18469D 00
0.30D 05	0.177660 00	0.178170 00	0.178170 00	0.17817D 00	0.17817D 00
0.400 05	0.172720 00	0.173620 00	0.173620 00	0.17362D 00	0.173620 00
0.500 05	0.16881D 00	0.170220 00	0.170220 00	0.170220 00	0.17022D 00
0.600 05	0.165510 00	0.167550 00	0.167550 00	0.167550 00	0.16755D 00
0.700 05	0.16258D 00	0.16536D 00	0.165370 00	0.16537D 00	0.16537D 00
0.800 05	0.159910 00	0.163530 00	0.165540 00	0.163540 00	0.16354D 00
0.900 05	0.157400 00	0.161940 00	0.161960 00	0.161960 00	0.161960 00
0.10D 06	0.155000 00	0.160550 00	0.160580 00	0.160560 00	0.16058D 00
0.200 06	0.134010 00	0.151690 00	0.152110 00	0.152110 00	0.152110 00
0.300 06	0.11608D 00	0.146060 00	0.14753 00	0.14758D 00	0.14758D 00
0.400 06	0.100550 00	0.141230 00	0.14453D 00	0.14453D 00	0.14453D 00
0.50D 06	0.871 05D-01	0.136710 00	0.142240 00	0.14225D 00	0.14225D 00
0.600 06	0.754550-01	0.132360 00	0.140490 00	0.14045D 00	0.140450 00
0.700 06	0.653620-01	0.128150 00	0.136350 00	0.138950 00	0.13895D 00
0.800 06	0.56620D-01	0.124090 00	0.137490 00	0.137690 00	0.137690 00
0.90D 06	0.490470-01	0.120150 00	0.136250 00	0.136593 00	0.136590 00
0.100 07	0.424870-01	0.116340 00	0.135110 00	0.135620 00	0.13562D 00

t_D	500	1,000	2,000	4,000	10,000
0.200 07	0.101080-01	0.84267D-01	0.125330 00	0.129570 00	0.12958D 00
0.300 07	0.240310-02	0.610335-01	0.116540 00	0.126190 00	0.12628D 00
0.400 07	0.570330-03	0.442130-01	0.108370 00	0.123670 00	0.124050 00
0.500 07	0.137060-03	0.320250-01	0.100770 00	0.121480 00	0.122370 00
0.600 07	0.35396D-04	0.231 9X-01	0.937010-01	0.119430 00	0.121030 00
0.700 07	0.108300-04	0.168030-01	0.871 31D-01	0.117450 00	0.119910 00
0.800 07	0.377720-05	0.121 71D-01	0.810210-01	0.115520 00	0.118970 00
0.90D 07	0.87006D-06	0.881630-0:	0.753400-01	0.113630 00	0.118150 00
0.100 08		0.63859D-02	0.700570-01	0.111760 00	0.117420 00
0.200 08		0.25338D-03	0.33862D-01	0.947400-01	0.112760 00
0.300 08		0.13040D-04	0.16368D-01	0.8031 10-01	0.109760 00
0.400 OS		0.815460-06	0.791150-02	0.660790-01	0.107130 00
0.500 08			0.362340-02	0.577100-01	0.104610 00
0.600 08			0.184680-02	0.489200-01	0.102170 00
0.700 08			0.89151D-03	0.41 469D-01	0.997900-01
0.80D 08			0.430430-03	0.35153D-01	0.97463D-01
0.900 08			0.208400-03	0.29799D-01	0.951910-01
0.100 09			0.101 80D-03	0.25261D-01	0.929720-01
0.200 09				0.483960-02	0.73434D-01
0.30D 09				0.925609-03	0.58002D-01
0.400 09				0.17748D-03	0.458 140-01
0.50D 09				0.360170-04	0.36186D-01
0.600 09				0.88775D-05	0.28582D-01
0.700 09				0.262150-05	0.22576D-01
0.800 09				0.351290-06	01 7831D-01
0.90D 09					0.14084D-01
0.100 10					0.111253-C1
0.20D 10					0.104993-02
0.300 10					0.99853D-04
0.400 10					0.115670-04
0.525 10					0.195410-05

$r_{eD} = \infty$

t_D	q_D	t_D	q_D	t_D	q_D
0.1 0D-01	0.534120 00	0.300 03	0.211110 00	0.500 07	0.122370 00
0.200-01	0.451450 00	0.400 03	0.210890 00	0.600 07	0.121039 00
0.30D-01	0.426500 00	0.500 03	0.210670 00	0.700 07	0.11991D 00
0.400-0 1	0.404450 00	0.600 03	0.210450 00	0.80D 07	0.11897D 00
0.550-01	0.338720 00	0.700 03	0.210240 00	0.90D 07	0.118150 00
0.600-01	0.376690 00	0.800 03	0.21002D 00	0.100 08	0.117420 00
0.70D-01	0.367040 00	0.900 03	0.20981D 00	0.200 08	0.112850 00
0.80D-01	0.359050 00	0.100 04	0.209600 00	0.30D 08	0.110350 00
0.90D-01	0.352270 00	0.200 04	0.207550 00	0.400 08	0.108630 00
0.10D 00	0.346410 00	0.300 04	0.205620 00	0.500 08	0.107340 00
0.200 00	0.312140 00	0.400 04	0.203800 00	0.600 08	0.106310 00
0.300 00	0.295109 00	0.500 04	0.202099 00	0.700 08	0.105450 00
0.400 00	0.28418D 00	0.60D 04	0.20045D 00	0.800 OS	0.10471D 00
0.500 00	0.276320 00	0.700 04	0.198910 00	0.900 08	0.104070 00
0.60D 00	0.27028D 00	0.800 04	0.197460 00	0.10D 09	0.103510 00
0.700 00	0.265420 00	0.900 04	0.196030 00	0.200 09	0.999420-01
0.800 00	0.261430 00	0.100 05	0.194770 00	0.300 09	0.979660-01
0.900 00	0.257990 00	0.200 05	0.184690 00	0.400 09	0.966110-01
0.100 01	0.253040 00	0.300 05	0.178170 00	0.500 09	0.955650-01
0.200 01	0.238170 00	0.400 05	0.173620 00	0.600 09	0.947630-01
0.300 01	0.230283 00	0.500 05	0.170220 00	0.700 09	0.940790-01
0.400 01	0.225570 00	0.60D 05	0.167550 00	0.800 09	0.93494D-01
0.500 01	0.222440 00	0.700 05	0.16537D 00	0.900 09	0.92984D-01
0.600 01	0.22021D 00	0.803 05	0.163540 00	0.100 10	0.92533D-01
0.700 01	0.21856D 00	0.900 05	0.161960 00	0.200 10	0.896660-01
0.80D 01	0.217310 00	0.100 06	0.160530 00	0.30D 10	0.880730-01
0.900 01	0.216330 00	0.200 06	0.152110 00	0.40D 10	0.86975D-01
0.10D 02	0.215550 00	0.303 06	0.147580 00	0.50D 10	0.86142D-01
0.200 02	0.212500 00	0.400 06	0.144530 00	0.600 10	0.85473D-01
0.30D 02	0.211900 00	-0.500 06	0.142250 00	0.700 10	0.849160-01
0.400 02	0.211740 00	0.600 06	0.140450 00	0.800 10	0.84439D-01
0.500 02	0.211670 00	0.700 06	0.138950 00	0.900 10	0.840220-01
0.600 02	0.2116413 00	0.80D 06	0.137690 00	0.100 11	0.83653D-01
0.700 02	0.211620 00	0.900 06	0.13659D 00		
0.800 02	0.211593 00	0.100 07	0.135620 00		
0.90D 02	0.211570 00	0.200 07	0.129580 00		
0.100 03	0.211550 00	0.300 07	0.12628D 00		
0.200 03	0.211330 00	0.400 07	0.124050 00		

q_D FOR DIFFERENT VALUES OF r_{eD} ($\omega = 0.001$, $\lambda = 10^{-7}$)

t_D	r_{eD} = 10	20	50	100	200
0.1 OD-01	0.53392D 00	0.533920 00	0.533920 00	0.533920 00	0.53392D 00
0.20D-01	0.46114D 00	0.46114D 00	0.461140 00	0.46114D 00	0.46114D 00
0.30D-01	0.42610D 00	0.426100 00	0.42610D 00	0.426100 00	0.42610D 00
0.40D-01	0.35467D 00	0.40398D 00	0.40398D 00	0.403981) 00	0.403980 00
0.50D-01	0.314051) 00	0.38818D 00	0.38818D 00	0.38818D 00	0.38818D 00
0.60D-01	0.278093 00	0.37608D 00	0.37608D 00	0.376060 00	0.37608D 00
0.70D-01	0.24625D 00	0.36637D 00	0.36637D 00	0.366370 00	0.36637D 00
0.80D-01	0.21806D 00	0.358320 00	0.3583213 00	0.35832D 00	0.35832D 00
0.90D-01	0.19309D 00	0.35148D 00	0.35148D 00	0.351460 00	0.35148D 00
0.10D 00	0.170993 00	0.34556D 00	0.34556D 00	0.34556D 00	0.34556D 00
0.20D 00	0.50691D-01	0.272820 00	0.31080D 00	0.31080D 00	0.31080D 00
0.30D 00	0.15027D-01	0.219750 00	0.293340 00	0.293340 00	0.29334D 0C
0.40D 00	0.44513D-02	0.17701D 00	0.28203D 0D	0.282030 00	0.28203D 00
0.50D 00	0.13210D-02	0.14258D 00	0.273820 00	0.27382D 00	0.27382D 00
0.60D 00	0.40004D-03	0.11485D 00	0.26743 C0	0.267439 00	0.267433 00
0.70D 00	0.13040D-03	0.92513D-01	0.262250 00	0.262259 00	0.26225D 00
0.80D 00	0.49832D-04	0.74522D-01	0.251660 00	0.25792D 00	0.25792D 00
0.90D 00	0.231 23D-04	0.60030D-01	0.245380 00	0.254200 00	0.254200 00
0.10D 01	0.1 1947D-04	0.48358D-01	0.23929D 00	0.25097D 00	0.25097D 00
0.20D 01	0.25685D-05	0.557270-02	0.186470 00	0.23151D 00	0.23151D 00
0.300 01	0.62711D-05	0.65763D-03	0.14534D 00	0.221430 00	0.221430 00
0.400 01	0.58475D-05	0.10055D-03	0.11329D 00	0.207071) 00	0.214770 00
0.503 01	0.52896D-05	0.34487D-04	0.88310D-01	0.19668D 00	0.20987D C0
0.600 01	0.50069D-05	0.21812D-04	0.68846D-01	0.18683D G0	0.206030 03
0.70D 01	0.489200-05	0.17063D-04	0.53677D-01	0.17748D 00	0.20285D C0
0.80D 01	0.48628D-05	0.155460-04	0.41857D-01	0.168610 00	0.200230 00
0.90D 01	0.48627D-05	0.15790D-04	0.32646D-01	0.160170 00	0.197950 00
0.10D 02	0.48723D-05	0.16805D-04	0.25468D-01	0.152160 00	0.195960 00
0.20D 02	0.49435D-05	0.20822D-04	0.22139D-02	0.911510-01	0.174270 03
0.30D 02	0.49525D-05	0.20113D-04	0.30036D-03	0.54683D-01	0.156309 00
0.40D 02	0.49504D-05	0.19902D-04	0.14462D-03	0.32886D-01	0.140200 00
0.500 02	0.4051 0D-05	0.1 9881D-04	0.12762D-03	0.19857D-01	0.125750 00
0.600 02	0.49504D-05	0.19894D-04	0.12298D-03	0.12070D-01	0.11267D 00
0.70D 02	0.49501D-05	0.19909D-04	0.12166D-03	0.74140D-02	0.101310 00
0.800 02	0.49510D-05	0.19925D-04	0.12200D-03	0.46306D-02	0.90950D-01
0.900 02	0.49500D-05	0.19933D-04	0.122920-03	0.29667D-02	0.81670D-01
0.10D 03	0.49505D-05	0.19939D-04	0.12385D-03	0.19725D-02	0.73359D-01
0.20D 03	0.49499D-05	0.19949D-04	0.12534D-03	0.511820-03	0.25707D-01
0.300 03	0.49499D-05	0.199490-04	0.12491 D-03	0.497010-03	0.98674D-02
0.400 03	0.49497D-05	0.19949D-04	0.12485D-03	0.496740-03	0.46006D-02
0.50D 03	0.494933-05	0.19949D-04	0.124860-03	0.498320-03	0.285060-02
0.60D 03	0.49497D-05	0.19948D-04	0.124870-03	0.49924D-03	0.22711D-02
0.700 03	0.49497D-05	0.19948D-04	0.12488D-03	0.49953D-03	0.208040-02
0.80D 03	0.49496D-05	0.19948D-04	0.12488D-03	0.499520-03	0.201 76D-02
0.90D 03	0.49495D-05	0.199450-04	0.12488D-03	0.49940D-03	0.19962D-02
0.10D 04	0.49494D-05	0.19947D-04	0.12488D-03	0.49926D-03	0.19882D-02
0.20D 04	0.49490D-05	0.19945D-04	0.12488D-03	0.49885D-03	0.19801D-02
0.30D 04	0.49485D-05	0.19943D-04	0.12486D-03	0.49882D-03	0.19818D-02
0.400 04	0.49480D-05	0.19941D-04	0.12485D-03	0.49878D-03	0.19816D-02
0.50D 04	0.49475D-05	0.19939D-04	0.12484D-03	0.498740 -03	0.19812D-02
0.600 04	0.494700-05	0.19937D-04	0.12483D-03	0.498693-03	0.19808D-02
0.700 04	0.494653-05	0.19935D-04	0.12481D-03	0.49864D-03	0.1 9806D-02
0.80D 04	0.49460D-05	0.19933D-04	0.12480D-03	0.49859D-03	0.19804D-02
0.90D 04	0.494550-05	0.19931D-04	0.12479D-03	0.49854D-03	0.19802D-02
0.10D 05	0.49450D-05	0.19929D-04	0.12478D-03	0.49849D-03	0.19800D-02
0.20D 05	0.4940 1D-05	0.19909D-04	0.12465D-03	0.49799D-03	0.19780D-02
0.300 05	0.49351D-05	0.19889D-04	0.12453D-03	0.49750D-03	0.19761D-02
0.40D 05	0.49302D-05	0.19869D-04	0.12440D-03	0.49700D-03	0.19741D-02
0.50D 05	0.49252D-05	0.198500-04	0.12428D-03	0.496 500-03	0.19722D-02
0.60D 05	0.49203D-05	0.19830D-04	0.12415D-03	0.496 01D-03	0.19702D-02
0.70D 05	0.49154D-05	0.1981 0D-04	0.12403D-03	0.49551D-03	0.19682D-02
0.80D 05	0.49105D-05	0.19790D-04	0.12390D-03	0.49502D-03	0.19663D-02
0.900 05	0.49056D-05	0.1 9770D-04	0.12378D-03	0.49452D-03	0.19643D-02
0.10D 06	0.49007D-05	0.19750D-04	0.123660-03	0.49403D-03	0.19624D-02
0.20D 06	0.48518D-05	0.19554D-04	0.122430-03	0.48912D-03	0.19430D-02
0.30D 06	0.48035D-05	0.19359D-04	0.121 21D-03	0.48426D-03	0.19238D-02
0.40D 06	0.47557D-05	0.191 66D-04	0.120000-03	0.47944D-03	0.19049D-02
0.500 06	0.4708 3D-05	0.1897%-04	0.11881D-03	0.47468D-03	0.18861D-02
0.60D 06	0.46614D-05	0.18786D-04	0.11 762D-03	0.46996D-03	0.18674D-02
0.700 06	0.46150D-05	0.185990-04	0.11645D-03	0.46529D-03	0.18490D-02

t_D	10	20	50	100	200
0.800 06	0.456900-05	0.1841 40-04	0.115290-03	0.460660-03	0.183063-02
0.900 06	0.452350-05	'0.182310-04	0.1 14140-03	0.45608D-03	0.181 270-02
0.100 07	0.447850-05	0.180490-04	0.1 13010-03	0.451550-03	0.1 7948D-02
0.200 07	0.40519D-05	0.163300-04	0.102250-03	0.40861D-03	0.16253D-02
0.300 07	0.36659D-05	0.14774D-04	0.92512D-04	0.369760-03	0.14718D-02
0.400 07	0.331670-05	0.13367D-04	0.83703D-04	0.334610-03	0.133280-02
0.500 07	0.30008D-05	0.1'20940-04	0.757330-04	0.302790-03	0.12069D-02
0.600 07	0.271500-05	0.10942D-04	0.685220-04	0.274000-03	0.109300-02
0.700 07	0.24564D-05	0.98998D-05	0.61998D-04	0.247950-03	0.989750-03
0.800 07	0.222249-05	0.89569D-05	0.56094D-04	0.22438D-03	0.89628D-03
0.90D 07	0.20 107D-05	0.81 0370-05	0.50753D-04	0.203040-03	0.811640-03
0.100 08	0.181920-05	0.73318D-05	0.459210-04	0.183740-03	0.73499D-03
0.20D 08	0.66858D-06	0.26947D-05	0.16883D-04	0.67657D-04	0.272570-03
0.300 08	0.245720-06	0.990400-06	0.620740-05	0.2491 30-04	0.10108D-03
0.400 08	0.902660-07	0.36385D-06	0.226120-05	0.91698D-05	0.374720-04
0.50D 08	0.·331240-07	0.133520-06	0.837440-06	0.3371 40-05	0.138760-04
0.600 08	0.121580-07	0.490090-07	0.307490-05	0.12398D-05	0.513360-05
0.700 08	0.44986D-08	0.181370-07	0.113620-06	0.459540-06	0.1 9169D-05
0.830 08	0.171310-08	0.690720-08	0.43359D-07	0.175220-06	0.734160-06
0.903 08	0.6951 90-09	0.280300-08	0.17604D-07	0.71 127D-07	0.296610-06
0.100 09	0.30951D-09	0.124750-08	0.783720-08	0.316610-07	0.13277D-06

t_D	500	1,000	2,000	4,000	10,000
0.100-01	0.533920 00	0.533920 00	0.53392D 00	0.53392D 00	0.533920 00
0.20D-01	0.461140 00	0.461140 00	0.461140 00	0.46114D 00	0.46114D 00
0.300-01	0.426100 00	0.426100 00	0.426100 00	0.426100 00	0.42610D 00
0.400-01	0.403980 00	0.403960 00	0.403980 00	0.403960 00	0.40398D 0C
0.50D-01	0.388180 ·00	0.388189 00	0.38818D 00	0.388180 00	0.388130 00
0.600-01	0.376080 00	0.376080 00	0.37608D 00	0.376080 00	0.37608D 00
0.700-01	0.366370 00	0.366370 00	0.366370 00	0.366370 00	0.366370 00
0.80D-01	0.35832D 00	0.35832D 00	0.35832D 00	0.35832D 03	0.358320 00
0.900-01	0.351430 00	0.351460 00	0.351480 00	0.351480 00	0.351480 00
0.100 00	0.345569 00	0.345560 00	0.34556D 00	0.34556D 00	0.345540 00
0.20D 00	0.310800 00	0.31080D 00	0.31080D 00	0.310800 03	0.310630 00
0.309 00	0.29334D 00	0.293340 00	0.29334D 00	0.29330 00	0.293340 00
0.403 00	0.28203D 00	0.282030 00	0.282039 00	0.282050 00	0.28203D 00
0.500 00	0.27382D 00	0.273820 00	0.27382D 00	0.27382D 00	0.273620 00
0.600 00	0.267430 00	0.267430. 00	0.267430 00	0.267430 00	0.26743D 00
0.7CD 00	0.26225D 00	0.262250 00	0.26225D 00	0.26225D 00	0.262250 00
0.80D 00	0.25792D 00	0.257920 00	0.257920 00	0.257920 00	0.257920 00
0.900 00	0.254200 00	0.254200 00	0.25420D 00	0.254200 00	0.254263 00
0.100 01	0.250950 00	0.250970 00	0.250970 00	0.25097D 00	0.250950 00
0.200 01	0.231510 00	0.231510 00	0.231510 00	0.231510 00	0.231510 00
0.30D 01	0.221430 00	0.221430 00	0.221430 00	0.22143D 00	0.221430 00
0.40D 01	0.214770 00	0.214770 00	0.214770 00	0.214770 00	0.214770 00
0.500 01	0.200870 00	0.209870 00	0.209870 00	0.209670 00	0.209379 00
0.600 01	0.206033 00	0.206033 00	0.206030 00	0.206030 00	0.206030 00
0.70D 01	0.202630 00	0.20288D 00	0.20268D 00	0.20268D 00	0.20288D 00
0.80D 01	0.20023D 00	0.200233 00	0.200230 00	0.200230 00	0.20023D 00
0.900 01	0.197950 00	0.197950 00	0.197950 00	0.19795D 00	0.197950 00
0.100 02	0.195960 00	0.19596D 00	0.19596D 00	0.19596D 00	0.195960 00
0.20D 02	0.183740 00	0.18374D 00	0.183740 00	0.183740 00	0.18374D 00
0.300 02	0.177270 00	0.177270 00	0.177270 00	0.177270 00	0.177270 00
0.40D 02	0.172950 03	0.17295D 00	0.17295D 00	0.17295D 00	0.17295D 00
0.500 02	0.169750 00	0.169750 00	0.169750 00	0.169750 00	0.169750 00
0.600 02	0.167210 00	0.167210 00	0.167210 00	0.167210 00	0.167210 00
0.7CD 02	0.16513D 03	0.165130 00	0.165130 00	0.165130 00	0.16513D 00
0.830 02	0.161510 00	0.16337D 00	0.163370 00	0.163370 00	0.16337D 00
0.900 02	0.159140 00	0.161550 00	0.161659 00	0.16185D 00	0.161659 0C
0.100 03	0.156830 00	0.16052D 00	0.16052D 00	0.16052D 00	0.160523 0C
0.2CD 03	0.135830 00	0.152299 00	0.152290 00	0.152290 00	0.15229D 00
0.300 03	0.11798D 00	0.147910 00	0.147910 00	0.147910 00	0.147910 00
0.400 03	0.102660 00	0.142170 00	0.14498D 00	0.14498D 00	0.14498D 00
0.500 03	0.89546D-01	0.137840 00	0.142610 00	0.142810 00	0.142810 00
0.60D 03	0.783240-01	0.133700 00	0.141100 00	0.141100 00	0.141100 00
0.700 03	0.68719D-01	0.129750 00	0.13971D 00	0.139710 00	0.139710 00

t_D	500	1,000	2,000	4,000	10,000
0.800 03	0.604990-01	0.125950 00	0.13854D 00	0.139540 00	0.13854D 00
0.900 03	0.534540-01	0.122310 00	0.13753D 00	0.13753D 00	0.13753D 00
0.10D a4	0.474440-01	0.118930 00	0.136650 00	0.13665D 00	0.13665D 00
0.200 04	0.19236D-01	0.91 0020-01	0.127830 00	0.13142D 00	0.13142D 00
0.300 04	0.132860-01	0.727840-01	0.120960 00	0.12884D 00	0.12884D 00
0.40D 04	0.120320-01	0.60855D-01	0.115190 00	0.127260 00	0.12726D 00
0.50D 04	0.11769D-01	0.530450-01	0.11033D 00	0.12619D 00	0.12619D 00
0.60D 04	0.117140-01	0.479300-01	0.106250 00	0.12442D 00	0.12541D 00
0.700 04	0.11700D-01	0.44580D-01	0.102810 00	0.12339D 00	0.12483D 00
0.800 04	0.1 1695D-01	0.423550-01	0.999160-01	0.12248D 00	0.12438D 00
0.90D a4	0.11692D-01	0.409470-01	0.97482D-01	0.121670 00	0.12403D 00
0.100 05	0.1 1690D-01	0.400050-01	0.95433D-01	0.120940 00	0.12375D 00
0.200 05	0.116810-01	0.382230-01	0.864800-01	0.11692D 00	0.12262D 00
0.300 05	0.116700-01	0.381 670-01	0.84860D-01	0.115650 00	0.12239D 00
0.400 05	0.11659D-01	0.38136D-01	0.84543D-01	0.115250 00	0.12224D 00
0.500 05	0.1 1648D-01	0.381070-01	0.84458D-01	0.11511D 00	0.12220D 00
0.600 05	0.116370-01	0.38078D-01	0.844130-01	0.115050 00	0.12218D 00
0.700 05	0.116260-01	0.3804 9D-01	0.843750-01	0.115020 00	0.12217D 00
0.800 05	0.116150-01	0.380200-01	0.843390-01	0.115000 00	0.122160 00
0.90D 05	0.116040-01	0.37991D-01	0.84302D-01	0.114980 00	0.12215D 00
0.10D 06	0.11593D-01	0.379620-01	0.842660-01	0.114960 00	0.12215D 00
0.200 06	0.114850-01	0.37672D-01	0.839090-01	0.114790 00	0.12207D 00
0.300 06	0.113780-01	0.373850-01	0.835530-01	0.11461D 00	0.121990 00
0.40D 06	0.112720-01	0.371000-01	0.831980-01	0.114430 00	0.121910 00
0.500 06	0.11167D-01	0.36817D-01	0.82845D-01	0.114250 00	0.12184D 00
0.60D 06	0.110630-01	0.365360-01	0.824930-01	0.114050 00	0.121760 00
0.700 06	0.109590-01	0.362570-01	0.821430-01	0.113900 00	0.121690 00
0.800 06	0.10857D-01	0.359810-01	0.817940-01	0.113730 00	0.121610 03
0.900 06	0.107560-01	0.35706D-01	0.81447D-01	0.113550 00	0.121530 00
0.100 07	0.10656D-01	0.354340-01	0.811010-01	0.11337D 00	0.12146D 00
0.200 07	0.970250-02	0.328220-01	0.77725D-01	0.111640 00	0.120730 00
0.300 07	0.88346D-02	0.304020-01	0.744910-01	0.109950 00	0.120040 00
0.400 07	0.804440-02	0.281610-01	0.71392D-01	0.108290 00	0.11938D 00
0.500 07	0.73249D-02	0.26085D-01	0.68424D-01	0.106660 00	0.118740 00
0.600 07	0.66697D-02	0.241630-01	0.655300-01	0.10507D 00	0.11813D 00
0.703 07	0.60731 0-02	0.223520-01	0.626560-01	0.103510 00	0.117550 00
0.80D 07	0.552990 -02	0.207320-01	0.602460-01	0.101970 00	0.116993 00
0.900 07	0.503530-02	0.19204D-01	0.57745D-01	0.100470 00	0.116460 00
0.10D 08	0.45849D-02	0.17789D-01	0.55348D-01	0.98989D-01	0.11594D 00
0.200 08	0.17964D-02	0.827400-02	0.362490-01	0.855320-01	0.11160D 00
0.300 08	0.70386D-03	0.38492D-02	0.2 3759D-01	0.740770-0 1	0.108220 00
0.400 08	0.27572D-03	0.17909D-02	0.155790-01	0.64223D-01	0.10530 00
0.500 08	0.10791 D-03	0.833120-03	0.1 0218D-01	0.557060-01	0.10273D 00
0.600 08	0.422100-04	0.38735D-03	0.670320-02	0.483300-01	0.100280 00
0.700 08	0.165660-04	0.180010-03	0.439760-02	0.419340-01	0.97934D-01
0.80D 08	0.660240-05	0.83742D-04	0.288500-02	0.36387D-01	0.956 73D-01
0.90D 08	0.273490-05	0.391 700-04	0.18925D-02	0.31574D-01	0.93477D-01
0.100 09	0.121340-05	0.185840-04	0.124120-02	0.27397D-01	0.91339D-01
0.200 09			0.19695D-04	0.6631 6D-02	0.72529D-01
0.300 09			0.60632D-06	0.16040D-02	0.57599D-01
0.400 09				0.38732D-03	0.45742D-01
0.50D 09				0.945210-04	0.36326D-01
0.600 09				0.2461 9D-04	0.28848D-01
0.703 09				0.752400-05	0.2291 0D-01
0.80D 09				0.26554D-05	0.181 94D-01
0.90D 09				0.69310D-06	0.14449D-01
0.100 10					0.11475D-01
0.200 10					0.11435D-02
0.300 10					0.11448D-03
0.40D 10					0.13512D-04

$r_{eD} = \infty$

t_D	q_D
0.10D-01	0.533920 00
0.200-01	0.461140 00
0.300-01	0.426100 00
0.40D-01	0.40398D 00
0.500-01	0.383180 00
0.60D-01	0.376060 00
0.700-01	0.366370 00
0.80D-01	0.358320 00
0.900-01	0.35148D 00
0.100 00	0.345560 00
0.200 00	0.310300 00
0.300 00	0.293340 C0
0.400 00	0.282030 00
0.500 00	0.273620 00
0.60D 00	0.26743D 00
0.700 00	0.262250 00
0.800 C0	0.25792D 00
0.900 00	0.254200 00
0.10D 01	0.250970 00
0.200 01	0.231510 00
0.300 01	0.221430 00
0.400 01	0.214770 00
0.500 01	0.209870 00
0.600 01	0.206030 00
0.700 01	0.202830 00
0.80D 01	0.200230 00
0.900 01	0.197950 00
0.100 02	0.195950 00
0.20D 02	0.18374D 00
0.300 02	0.177270 00
0.400 02	0.172950 00
0.503 02	0.169750 00
0.600 02	0.167210 00
0.70D 02	0.16513D 00
0.80D 02	0.16337D 00
0.900 02	0.161850 00
0.100 03	0.160520 00
0.200 03	0.15225'0 00
0.300 03	0.14791D 00
0.400 03	0.144980 00
0.500 03	0.14281D 00
0.600 03	0.14110D 00
0.700 03	0.139710 00
0.800 03	0.136540 00
0.900 03	0.137530 00
0.100 04	0.136650 00
0.200 04	0.131420 00
0.300 04	0.128840 00
0.40D 04	0.127269 00
0.500 04	0.12619D 00
0.600 04	0.125410 00
0.700 04	0.12483D 00
0.80D 04	0.124320 00
0.900 04	0.124030 00
0.10D 05	0.123750 00
0.200 05	0.122620 00
0.30D 05	0.122390 00

t_D	q_D
0.400 05	0.12232D 00
0.500 05	0.12230D 00
0.600 05	0.12229D 00
0.700 05	0.12228D 00
0.800 05	0.12227D 00
0.900 05	0.12226D 00
0.100 06	0.12226D 00
0.200 06	0.12218D 00
0.300 06	0.12211D 00
0.400 06	0.12203D 00
0.500 06	0.12196D 00
0.600 06	0.12189D 00
0.700 06	0.12182D 00
0.800 06	0.12175D 00
0.900 06	0.12167D 00
0.100 07	0.12160D 00
0.200 07	0.12091D 00
0.300 07	0.12026D 00
0.400 07	0.11964D 00
0.500 07	0.11906D 00
0.600 07	0.11850D 00
0.700 07	0.11797D 00
0.800 07	0.11747D 00
0.900 07	0.11699D 00
0.10D 08	0.11653D 00
0.20D 08	0.11294D 00
0.300 08	0.11054D 00
0.400 08	0.10880D 00
0.500 03	0.10748D 00
0.600 08	0.10642D 00
0.70D 08	0.10554D 00
0.800 06	0.10479D 00
0.900 08	0.10414D 00
0.10D 09	0.10357D 00
0.20D 09	0.99967D-01
0.30D 09	0.97982D-01
0.400 09	0.96622D-01
0.5CD 09	0.95594D-01
0.600 09	0.94770D-01
0.700 09	0.94085D-01
0.80D 09	0.93499D-01
0.900 09	0.92988D-01
0.100 10	0.92537D-01
0.200 10	0.89670D-01
0.30D 10	0.88074D-01
0.400 10	0.86976D-01
0.500 10	0.86143D-01
0.600 10	0.85474D-01
0.70D 10	0.84916D-01
0.800 10	0.84439D-01
0.900 10	0.84023D-01
0.100 11	0.83653D-01
0.20D 11	0.81304D-01
0.300 11	0.79989D-01
0.400 11	0.79082D-01
0.500 11	0.78392D-01
0.600 11	0.77837D-01
0.700 11	0.77375D-01
0.80D 11	0.76978D-01
0.90D 11	0.76632D-01

q_D FOR DIFFERENT VALUES OF r_{eD} ($\omega = 0.01$, $A = 10^{-6}$)

t_D	r_{eD} = 10	20	50	100	200
0.10D-01	0.98377D 00	0.98377D 00	0.98377D 00	0.983770 00	0.98377D 00
0.20D-01	0.80058D 00	0.800580 00	0.800580 00	0.800580 00	0.80058D 00
0.300-01	0.716200 00	0.716200 00	0.716200 00	0.716200 00	0.716200 00
0.40D-01	0.664400 00	0.664400 00	0.664400 00	0.664400 00	0.664400 00
0.500-01	0.628180 00	0.628160 00	0.628180 00	0.628180 00	0.62818D 00
0.600-01	0.600890 00	0.60089D 00	0.600890 00	0.600890 00	0.600890 00
0.700-01	0.579280 00	0.579260 00	0.579280 00	0.579280 00	0.579280 00
0.80D-01	0.561570 00	0.561570 00	0.56157D 00	0.561570 00	0.561570 00
0.90D-01	0.546690 00	0.546690 00	0.546690 00	0.546690 00	0.546690 00
0.100 00	0.533930 00	0.53392D 00	0.533920 00	0.53392D 00	0.533920 00
0.200 00	0.461140 00	0.461140 00	0.461140 00	0.461140 00	0.461140 00
0.30D 00	0.426110 00	0.426110 00	0.426110 00	0.426110 00	0.426110 00
0.400 00	0.354680 00	0.40398D 00	0.403980 00	0.403980 00	0.403980 00
0.500 00	0.314060 00	0.388190 00	0.388190 00	0.388190 00	0.388190 00
0.600 00	0.278100 00	0.376080 00	0.376080 00	0.376080 00	0.37608D 00
0.700 00	0.246260 00	0.366370 00	0.36637D 00	0.36637D 00	0.366370 00
0.80D 00	0.218070 00	0.358320 00	0.358320 00	0.358320 00	0.358320 00
0.900 00	0.193110 00	0.351490 00	0.351490 00	0.351490 00	0.351490 00
0.10D 01	0.171000 00	0.34557D 00	0.3455713 00	0.34557D 00	0.34557D 00
0.200 01	0.50723D-01	0.27283D 00	0.31081D 00	0.31081D 00	0.310810 00
0.300 01	0.150670-01	0.219780 00	0.293360 00	0.293360 00	0.293360 00
0.400 01	0.44939D-02	0.177050 00	0.282050 00	0.282050 00	0.282050 00
0.500 01	0.13649D-02	0.142640 00	0.273840 00	0.273840 00	0.273840 00
0.600 01	0.444350-03	0.114920 00	0.267460 00	0.267460 00	0.267460 00
0.700 01	0.17486D-03	0.925960-01	0.262280 00	0.262280 00	0.262280 00
0.80D 01	0.94374D-04	0.74617D-01	0.25170D 00	0.257950 00	0.25795D 00
0.90D 01	0.676640-04	0.601360-01	0.24542D 00	0.254240 00	0.254240 00
0.10D 02	0.56470D-04	0.48473D-01	0.239340 00	0.25101D 00	0.251010 00
0.200 02	0.471310-04	0.573990-02	0.186590 00	0.231570 00	0.23157D 00
0.300 02	0.50821D-04	0.835090-03	0.145550 00	0.221510 00	0.221510 00
0.400 02	0.50396D-04	0.279730-03	0.113600 00	0.207200 00	0.214880 00
0.500 02	0.498250-04	0.213870-03	0.887180-01	0.196850 00	0.210000 00
0.600 02	0.495500-04	0.201240-03	0.693490-01	0.187050 00	0.206170 00
0.700 02	0.494320-04	0.19650D-03	0.542690-01	0.177760 00	0.20305D 00
0.80D 02	0.494030-04	0.194980-03	0.425280-01	0.168940 00	0.200410 00
0.900 02	0.49403D-04	0.19524D-03	0.33387D-01	0.160570 00	0.198150 00
0.100 03	0.494120-04	0.19623D-03	0.262700-01	0.152630 00	0.19617D 00
0.200 03	0.494790-04	0.200250-03	0.32887D-02	0.924090-01	0.174770 00
0.300 03	0.49482D-04	0.199510-03	0.141460-02	0.567390-01	0.157190 00
0.400 03	0.49478D-04	0.19929D-03	0.126330-02	0.35609D-01	0.141600 00
0.500 03	0.49472D-04	0.199250-03	0.12466D-02	0.23093D-01	0.127750 00
0.600 03	0.494670-04	0.19924D-03	0.12420D-02	0.15678D-01	0.115460 00
0.700 03	0.494610-04	0.199240-03	0.12406D-02	0.11284D-01	0.104550 00
0.800 03	0.49457D-04	0.19923D-03	0.12408D-02	0.868100-02	0.948650-01
0.900 03	0.494510-04	0.199210-03	0.124160-02	0.713860-02	0.862680-01
0.10D 04	0.49447D-04	0.19920D-03	0.124240-02	0.62252D-02	0.766370-01
0.200 04	0.49396D-04	0.199010-03	0.12426D-02	0.490810-02	0.366410-01
0.300 04	0.49346D-04	0.19881D-03	0.124090-02	0.48901D-02	0.238720-01
0.400 04	0.492970-04	0.19861D-03	0.12396D-02	0.488530-02	0.199800-01
0.50D 04	0.49247D-04	0.19841D-03	0.12384D-02	0.48820D-02	0.187880-01
0.600 04	0.49197D-04	0.198210-03	0.123720-02	0.48780D-02	0.18416D-01
0.700 04	0.491480-04	0.198010-03	0.12359D-02	0.487350-02	0.18293D-01
0.800 04	0.490980-04	0.19781D-03	0.12347D-02	0.486860-02	0.182440-01
0.900 04	0.490480-04	0.19761D-03	0.12335D-02	0.486370-02	0.182160-01
0.100 05	0.48999D-04	0.19741D-03	0.12322D-02	0.48587D-02	0.181950-01
0.200 05	0.48506D-04	0.195430-03	0.12199D-02	0.481050-02	0.180230-01
0.300 05	0.480190-04	0.193460-03	0.12077D-02	0.476300-02	0.178590-01
0.400 05	0.475360-04	0.191520-03	0.11956D-02	0.47161D-02	0.17694D-01
0.500 05	0.470590-04	0.189590-03	0.11836D-02	0.46696D-02	0.17531D-01
0.60D 05	0.465860-04	0.187690-03	0.11718D-02	0.46235D-02	0.173690-01
0.700 05	0.461180-04	0.185800-03	0.116000-02	0.45779D-02	0.172090-01
0.800 05	0.456540-04	0.18394D-03	0.11484D-02	0.45328D-02	0.17050D-01
0.900 05	0.451950-04	0.182090-03	0.11369D-02	0.44881D-02	0.168930-01
0.10D 06	0.447410-04	0.180260-03	0.11255D-02	0.44439D-02	0.167370-01
0.20D 06	0.404430-04	0.162950-03	0.10178D-02	0.40246D-02	0.152570-01
0.300 06	0.365580-04	0.147300-03	0.92039D-03	0.364490-02	0.139080-01
0.400 06	0.330460-04	0.133160-03	0.83229D-03	0.330100-02	0.126780-01
0.50D 06	0.298710-04	0.120370-03	0.752630-03	0.298950-02	0.115570-01

t_D	500	1,000	2,000	4,000	10,000
0.100 05	0.834200-01	0.13405D 00	0.144220 00	0.144220 00	0.14422D 00
0.200 05	0.746 13D-01	0.126160 00	0.141630 00	0.142640 00	0.142640 00
0.300 05	0.734590-01	0.123850 00	0.140760 00	0.142250 00	0.14225D 00
0.400 05	0.729600-01	0.123010 00	0.140370 00	0.142060 00	0.142080 00
0.500 05	0.72516D-01	0.122550 00	0.140150 00	0.141970 00	0.14197D 00
0.600 05	0.720790-01	0.122200 00	0.139990 00	0.141840 00	0.141860 00
0.700 05	0.716470-01	0.121880 00	0.139840 00	0.141730 00	0.141760 00
0.800 05	0.71217D-01	0.121570 00	0.139700 00	0.141630 00	0.141660 00
0.900 05	0.70791D-01	0.121250 00	0.139570 00	0.141530 00	0.141560 00
0.10D 06	0.70 367D-01	0.120940 00	0.139430 00	0.141440 00	0.14147D 00
0.20D 06	0.66262D-01	0.117890 00	0.138110 00	0.140480 00	0.140530 00
0.300 06	0.62398D-01	0.114930 00	0.136830 00	0.139530 00	0.139640 00
0.400 06	0.58759D-01	0.112050 00	0.135590 00	0.133720 00	0.138800 00
0.500 06	0.553330-01	0.109240 00	0.13438D 00	0.137910 00	0.138000 00
0.600 06	0.521070-01	0.106510 00	0.133200 00	0.137140 00	0.137240 00
0.700 06	0.49070D-01	0.103360 00	0.132060 00	0.13640D 00	0.136530 00
0.800 06	0.4621 1D-01	0.10128D 00	0.130940 00	0.135700 00	0.135840 00
0.90D 06	0.43518D-01	0.987600-01	0.129850 00	0.135030 00	0.135200 00
0.100 07	0.409830-01	0.96311D-01	0.128780 00	0.134400 00	0.134580 00
0.200 07	0.22497D-01	0.750570-01	0.119160 00	0.129280 00	0.129770 00
0.30D 07	0.123570-01	0.586090-01	0.110840 00	0.125630 00	0.126580 00
0.40D 07	0.679010-02	0.45809D-01	0.103350 00	0.122750 00	0.124300 00
0.500 07	0.373210-02	0.358210-01	0.96479D-01	0.12030D 00	0.12257D 00
0.600 07	0.205140-02	0.28017D-01	0.90106D-01	0.118090 00	0.12118D 00
0.700 07	0.112730-02	0.21916D-01	0.84174D-01	0.116030 00	0.120040 00
0.80D 07	0.61931D-03	01 71450-01	0.786410-01	0.114070 00	0.11907D 00
0.900 07	0.340160-03	0.134 120-01	0.734740-01	0.11217D 00	0.118230 00
0.100 08	0.18695D-03	0.104930-01	0.68649D-01	0.110330 00	0.117490 00
0.200 08	0.10697D-05	0.89936D-03	0.348100-01	0.93733D-01	0.112680 00
0.300 08		0.78249D-04	0.17652D-01	0.79664D-01	0.109598 00
0.400 08		0.88526D-05	0.89512D-02	0.67707D-01	0.106930 00
0.500 08			0.453870-02	0.575440-01	0.104410 00
0.60D 08			0.230050-02	0.489070-01	0.101970 00
0.70D 08			0.116540-02	0.41567D-01	0.996000-01
0.80D 08			0.59019D-03	0.35328D-01	0.972830-01
0.9CD 08			0.2 99170-03	0.300250-01	0.950200-01
0.10D 09			0.15227D-03	0.2551 9D-01	0.92809D-01
0.200 09			0.336960-07	0.501840-02	0.73346D-01
0.30D 09				0.98525D-03	0.579640-01
0.400 09				0.19375D-03	0.45808D-01
0.500 09				0.400020-04	0.36201D-01
0.600 09				0.98666D-05	0.28609D-01
0.700 09				0.29655D-05	0.22609D-01
0.80D 09				0.541 27D-06	0.17868D-01
0.900 09					0.14121D-01
0.100 10					01 1159D-01
0.200 10					0.10589D-02
0.30D 10					0.10121D-03
0.400 10					0.11 742D-04

t_D	10	20	50	100	200
0.600 06	0.27001D-04	0.108810-03	0.68059D-03	0.270750-02	0.105350-01
0.700 06	0.24407D-04	0.98359D-04	0.615450-03	0.24520D-02	0.960330-02
0.800 06	0.22062D-04	0.88913D-04	0.556540-03	0.222070-02	0.875410-02
0.900 06	0.19943D-04	0.803740-04	0.503270-03	0.201120-02	0.79800D-02
0.100 07	0.18027D-04	0.726550-04	0.455100-03	0.18214D-02	0.727430-02
0.200 07	0.65657D-05	0.26472D-04	0.166400-03	0.67614D-03	0.28821D-02
0.300 07	0.23914D-05	0.96453D-05	0.608440-04	0.251000-03	0.11420D-02
0.400 07	0.87057D-06	0.35127D-05	0.222370-04	0.93136D-04	0.45241D-03
0.50D 07	0.31657D-06	0.127780-05	0.811790-05	0.345220-04	0.17908D-03
0.600 07	0.11517D-06	0.465050-06	0.296470-05	0.127970-04	0.708410-04
0.700 07	0.42277D-07	0.170760-06	0.109200-05	0.477790-05	0.281030-04
0.800 07	0.16010D-07	0.646830-07	0.414500-06	0.183140-05	0.11300D-04
0.900 07	0.648420-08	0.261990-07	0.167990-06	0.744720-06	0.47058D-05
0.100 08	0.28957D-08	0.11696D-07	0.750040-07	0.331690-06	0.20911D-05

t_D	560	1,000	2,000	*4,000*	10,000
0.1 00-01	0.98377D 00	0.98377D 00	0.983770 00	0.98377D 00	0.983770 00
0.200-01	0.80058D 00	0.800580 00	0.800580 00	0.80058D 00	0.800580 00
0.300-01	0.71620D 00	0.716200 00	0.716200 00	0.716200 00	0.716200 00
0.400-01	0.66440D 00	0.664400 00	0.664400 00	0.664400 00	0.664400 00
0.50D-01	0.62818D 00	0.628180 00	0.62818D 00	0.62818D 00	0.628180 00
0.60D-01	0.60089D 00	0.600890 00	0.600890 00	0.60089D 00	0.60089D 00
0.70D-01	0.57928D 00	0.579280 00	0.579280 00	0.579280 00	0.57928D 00
0.80D-01	0.56157D 00	0.561570 00	0.561570 00	0.561570 00	0.561570 00
0.900-01	0.54669D 00	0.546690 00	0.546690 00	0.546690 00	0.546690 00
0.10D 00	0.53392D 00	0.533920 00	0.533920 00	0.533920 00	0.533920 00
0.20D 00	0.461140 00	0.46114D 00	0.461140 00	0.461140 00	0.461140 00
0.300 00	0.42611D 00	0.426110 00	0.426110 00	0.426110 00	0.426110 00
0.400 00	0.403980 00	0.403980 00	0.403980 00	0.403980 00	0.403980 00
0.500 00	0.388190 00	0.388190 00	0.38819D 00	0.388190 00	0.388190 00
0.600 00	0.37608D 00	0.376080 00	0.376080 00	0.37608D 00	0.376080 00
0.700 00	0.36637D 00	0.366370 00	0.366370 00	0.366370 00	0.366370 00
0.800 00	0.35832D 00	0.358320 00	0.358320 00	0.358320 00	0.358320 00
0.900 00	0.35149D 00	0.351490 00	0.351490 00	0.351490 00	0.351490 00
0.10D 01	0.34557D 00	0.345570 00	0.345570 00	0.345570 00	0.345570 00
0.200 01	0.31081D 00	0.310810 00	0.310810 00	0.310810 00	0.310810 00
0.300 01	0.29336D 00	0.29336D 00	0.293360 00	0.293360 00	0.293360 00
0.400 01	0.28205D 00	0.282050 00	0.28205D 00	0.282050 00	0.282050 00
0.50D 01	0.273840 00	0.273640 00	0.273840 00	0.273840 00	0.273840 00
0.600 01	0.267460 00	0.267460 00	0.267460 00	0.267460 00	0.267460 00
0.700 01	0.262280 00	0.26228D 00	0.262280 00	0.262280 00	0.262289 00
0.800 01	0.25795D 00	0.257950 00	0.257950 00	0.257950 00	0.257950 00
0.90D 01	0.254240 00	0.254240 00	0.25424D 00	0.254240 00	0.254240 00
0.100 02	0.25101D 00	0.251010 00	0.251010 00	0.25101D 00	0.251010 00
0.200 02	0.23'570 00	0.231570 00	0.231570 00	0.231570 00	0.23157D 00
0.30D 02	0.22'510 00	0.22151D 00	0.221510 00	0.221510 00	0.221510 00
0.400 02	0.21488D 00	0.21488D 00	0.214880 00	0.21488D 00	0.214880 00
0.500 02	0.21000D 00	0.210000 00	0.210000 00	0.210000 00	0.210000 00
0.600 02	0.20617D 00	0.20617D 00	0.206170 00	0.20617D 00	0.206170 00
0.700 02	0.20305D 00	0.203050 00	0.203050 00	0.203050 00	0.203050 00
0.800 02	0.20041D 00	0.200410 00	0.200410 00	0.200410 00	0.200410 00
0.900 02	0.19815D 00	0.198150 00	0.198150 00	0.198150 00	0.198150 00
0.100 03	0.196170 00	0.196170 00	0.196170 00	0.19617D 00	0.196170 00
0.200 03	0.184110 00	0.184110 00	0.184110 00	0.184110 00	0.184110 00
0.300 03	0.177790 00	0.177790 00	0.177790 00	0.177790 00	0.177790 00
0.400 03	0.17360D 00	0.173600 00	0.173600 00	0.173600 00	0.173600 00
0.500 03	0.1710520 00	0.170520 00	0.170520 00	0.170520 00	0.170520 00
0.600 03	0.1618110 00	0.168110 00	0.168110 00	0.16811D 00	0.168110 00
0.700 03	0.1616150 00	0.166150 00	0.166150 00	0.166150 00	0.166150 00
0.800 03	0.162740 00	0.164500 00	0.164500 00	0.164500 00	0.164500 00
0.900 03	0.16054D 00	0.163090 00	0.163090 00	0.163090 00	0.163090 00
0.10D 04	0.15842D 00	0.161870 00	0.161870 00	0.161870 00	0.161870 00
0.200 04	0.14009D 00	0.154630 00	0.154630 00	0.154630 00	0.154630 00
0.300 04	0.12577D 00	0.15111D 00	0.151110 00	0.151110 00	0.151110 00
0.40D 04	0.11456D 00	0.146830 00	0.148970 00	0.148970 00	0.14897D 00
0.500 04	0.10579D 00	0.143940 00	0.147510 00	0.147510 00	0.147510 00
0.60D 04	0.98917D-01	0.141410 00	0.146460 00	0.146460 00	0.146460 00
0.700 04	0.93537D-01	0.139190 00	0.145680 00	0.145680 00	0.145680 00
0.800 04	0.89321D-01	0.137250 00	0.145080 00	0.145080 00	0.14508D 00
0.90D *04*	0.86014D-01	0.135550 00	0.144600 00	0.144600 00	0.144600 00

$r_{eD} = \infty$

t_D	q_D	t_D	q_D
0.100-01	0.983770 00	0.40D 05	0.14208D 00
0.200-01	0.800580 00	0.500 05	0.141970 00
0.300-01	0.716200 00	0.60D 05	0.141860 00
0.40D-01	0.66440D 00	0.700 05	0.141760 00
0.50D-01	0.62818D 00	0.80D 05	0.141660 00
0.60D-01	0.60089D 00	0.90D 05	0.141560 00
0.700-01	0.579280 00	0.10D 06	0.141470 00
0.80D-01	0.561570 00	0.20D 06	0.140530 00
0.900-01	0.546690 00	0.300 06	0.139640 00
0.100 00	0.53392D 00	0.40D 06	0.138800 00
0.200 00	0.461140 00	0.500 06	0.13800D 00
0.300 00	0.426110 00	0.600 06	0.137240 00
0.40D 00	0.40398D 00	0.70D 06	0.136530 00
0.50D 00	0.388190 00	0.80D 06	0.13584D 00
0.600 00	0.376080 00	0.900 06	0.135200 00
0.700 00	0.366370 00	0.100 07	0.13458D 00
0.80D 00	0.35832D 00	0.200 07	0.12977D 00
0.90D 00	0.351491) 00	0.300 07	0.126560 00
0.100 01	0.34557D 00	0.40D 07	0.124300 00
0.20D 01	0.310810 00	0.500 07	0.12257D 00
0.30D 01	0.293360 00	0.600 07	0.121190 00
0.400 01	0.282050 00	0.7CD 07	0.120050 00
0.500 01	0.273840 00	0.800 07	0.11908D 00
0.600 01	0.267460 00	0.900 07	0.11824D 00
0.700 01	0.26228D 00	0.100 08	0.117500 00
0.80D 01	0.257950 00	0.200 08	0.112890 00
0.90D 01	0.254240 00	0.300 08	0.11037D 00
0.10D 02	0.25101D 00	0.400 08	0.108650 00
0.200 02	0.23157D 00	0.500 08	0.107350 00
0.30D 02	0.221510 00	0.600 08	0.10631D 00
0.400 02	0.214880 00	0.70D 08	0.105450 00
0.50D 02	0.21000D 00	0.800 08	0.104720 00
0.600 02	0.206170 00	0.900 08	0.104080 00
0.70D 02	0.203050 00	0.100 09	0.103510 00
0.800 02	0.200410 00	0.200 09	0.999440-01
0.900 02	0.198150 00	0.300 09	0.97968D-01
0.100 03	0.19617D 00	0.400 09	0.96612D-01
0.20D 03	0.18411D 00	0.500 09	0.955860-01
0.30D 03	0.177790 00	0.600 09	0.94764D-01
0.400 03	0.173600 00	0.700 09	0.94079D-01
0.50D 03	0.170520 00	0.800 09	0.93494D-01
0.603 03	0.16811D 00	0.900 09	0.92984D-01
0.700 03	0.166150 00	0.100 10	0.925330-01
0.80D 03	0.164500 00	0.200 10	0.89668D-01
0.900 03	0.163090 00	0.300 10	0.880730-01
0.10D 04	0.16187D 00	0.400 10	0.86975D-01
0.20D 04	0.154630 00	0.50D 10	0.86142D-01
0.300 04	0.151110 00	0.600 10	0.854730-01
0.400 04	0.148970 00	0.700 10	0.849160-01
0.500 04	0.147510 00	0.8CD 10	0.84439D-01
0.60D 04	0.146460 00	0.900 10	0.840220-01
0.70D 04	0.145680 00	0.10D 11	0.83653D-01
0.8CD 04	0.14508D 00	0.20D 11	0.81304D-01
0.900 04	0.144600 00	0.300 11	0.799890-01
0.100 05	0.144220 00	0.400 11	0.79082D-01
0.200 05	0.142640 00	0.500 11	0.78392D-01
0.30D 05	0.14225D 00	0.60D 11	0.77837D-01
		0.70D 11	0.77375D-01
		0.80D 11	0.76978D-01
		0.90D 11	0.76631 D-01

q_D FOR DIFFERENT VALUES OF r_{eD} ($\omega = 0.01$, $\lambda = 10^{-9}$)

t_D	r_{eD} = 10	20	50
01 OD-01	0.983770 00	0.983770 00	0.98377D 00
0.20D-01	0.800580 00	0.80058D 00	0.80058D 30
0.30D-01	0.716200 00	0.71620D 00	0.71620D 00
0.40D-01	0.664400 00	0.664400 00	0.664410 00
0.560-01	0.628160 00	0.62818D 00	0.62818D 03
0.60D-01	0.60083D 00	0.60083D 00	0.60088D 00
0.700-01	0.57928D 00	0.579280 03	0.57928D 00
0.80D-01	0.561570 00	0.561570 00	0.561570 00
0.90D-01	0.546680 00	0.546680 00	0.54668D 00
0.10D 00	0.53392D 00	0.533920 00	0.53392D 00
0.20D 00	0.461140 00	0.461140 00	0.46114D 00
0.300 00	0.42610D 00	0.42610D 00	0.426100 00
0.400 00	0.35467D 00	0.403933 00	0.40398D 00
0.500 00	0.314050 00	0.386183 00	0.38818D 00
0.600 00	0.27809D 00	0.376030 00	0.376030 00
0.700 00	0.24625D 00	0.366370 00	0.36637D 00
0.80D 00	0.21806D 00	0.358380 00	0.358320 00
0.900 00	0.193090 00	0.351480 00	0.351430 00
0.10D 01	0.17098D 00	0.345560 00	0.345560 C0
0.203 01	0.50688D-01	0.272320 00	0.31080D 00
0.300 01	0.15023D-01	0.219740 00	0.293340 00
0.40D 01	0.44466D-02	0.177000 00	0.[illegible]8203D 00
0.50D 01	0.131 62D-02	0.142570 00	0.27381D 00
0.600 01	0.39516D-03	0.11484D 00	0.267430 00
0.70D 01	0.125500-03	0.925040-01	0.26225D 00
0.800 01	0.44967D-04	0.745120-01	0.251660 00
0.90D 01	0.182460-04	0.600190-01	0.245370 00
0.100 02	0.70334D-05	0.483450-01	0.239290 03
0.200 02		0.55543D-02	0.18646D 00
0.300 02		0.638100-03	0.145320 00
0.40D 02		0.80848D-04	0.113250 00
0.500 02		0.14741D-04	0.88265D-01
0.60D 02		0.20632D-05	0.68790D-01
0.700 02			0.535120-01
0.800 02			0.41783D-01
0.900 02			0.32564D-01
0.100 03			0.25380D-01
0.200 03			0.20952D-02
0.300 03			0.17727D-03
0.40D 03			0.21027D-04
0.500 03			0.39927D-05

t_D	100	200	500	1,000	2,000
0.10D-01	0.963770 00	0.963770 00	0.93377D 00	0.933770 00	0.98377D C0
C.20D-01	0.80058D 00	0.80058D 00	0.800580 00	0.U0058D 00	0.80058D 00
0.300-01	0.716200 00	0.71620D 00	0.71620D 00	0.716200 00	0.71620D 00
0.400-01	0.664400 00	0.664439 00	0.664400 00	0.66440D 00	0.661400 00
0.505-01	0.628180 00	0.62813D 00	0.62813D 00	0.628165 00	0.62818D 00
0.60D-01	0.60088D 00	0.60086D 00	0.60088D 00	0.60058D 00	0.60068D 00
0.700-01	0.579250 00	0.579269 00	0.579230 03	0.57928D 00	0.579250 00
0.80D-01	0.56157D 00	0.561570 00	0.561570 00	0.56157D 03	0.561570 C0
0.90D-01	0.54668D 00	0.546680 00	0.54668D 00	0.546680 00	0.54668D 00
0.10D 00	0.533920 00	0.53392D 00	0.533920 00	0.533920 00	0.53392D 00
0.200 00	0.461140 03	0.46114D 00	0.461140 00	0.461140 00	0.46114D 00
0.30D 00	0.426100 00	0.426100 00	0.42610D 00	0.42610D 00	0.42610D 00
0.40D 00	0.40398D 00	0.403980 00	0.403980 00	0.403350 00	0.40398D 00
0.50D 00	0.388180 00	0.38818D 00	0.388180 00	0.38818D 00	0.38818D 00
0.600 00	0.376080 00	0.37608D 00	0.376080 00	0.376063 00	0.376053 00
0.700 00	0.366370 00	0.36637D 00	0.36637D 00	0.36637D 00	0.366370 00
0.800 00	0.35832D 00	0.353320 00	0.358320 00	0.356320 00	0.35832D 00
0.90D 00	0.351430 00	0.35148D 00	0.351480 00	0.351480 00	0.351480 00
0.100 01	0.345560 00	0.345560 00	0.34556D 00	0.345550 00	0.34556D 00
0.20D 01	0.310900 00	0.31080D 00	0.310800 03	0.310903 00	0.31080D 00
0.30D 01	0.293340 00	0.293349 00	0.293340 00	0.293340 00	0.29334D C0
0.40D 01	0.282038 05	0.282030 00	0.28203D 00	0.28203D 00	0.282038 00

t_D	100	200	500	1,000	2,000
0.503 01	0.27381D 00	0.273610 00	0.273810 00	0.27381D 00	0.273810 00
0.600 01	0.26743D 00	0.267430 00	0.267430 00	0.267430 00	0.267430 00
0.70D 01	0.26225D 00	0.262250 00	0.262250 00	0.262250 00	0.262253 00
0.8CD 01	0.25791D 00	0.257910 00	0.25791D 03	0.257910 00	0.257310 00
0.90D 01	0.25420D 00	0.254200 00	0.254200 00	0.254200 00	0.254203 00
0.100 02	0.25096D 00	0.250960 00	0.250960 00	0.25096D 00	0.250960 00
0.20D 02	0.23151D 00	0.251510 00	0.231510 00	0.231510 00	0.23151D 00
0.300 02	0.22142D 00	0.221420 00	0.221421) 00	0.221421) 00	0.221420 00
0.400 02	0.20705D 00	0.21476D 00	0.214760 00	0.214760 00	0.214760 00
0.500 02	0.19666D 00	0.209860 00	0.209860 00	0.20986D 00	0.209660 00
0.600 02	0.18681D 00	0.206010 00	0.206010 00	0.206010 00	0.206010 00
0.700 02	0.17745D 00	0.202670 00	0.20287D 00	0.202670 00	0.202870 03
0.80D 02	0.16857D 00	0.200210 00	0.20021D 00	0.200210 00	0.200210 00
0.900 02	0.16013D 00	0.197930 00	0.197533 00	0.19793D 00	0.137930 00
0.100 03	0.15211D 00	0.195930 00	0.195930 00	0.195330 00	0.195930 0C
0.200 03	0.91011D-01	0.174220 00	0.183700 00	0.183700 00	0.183730 00
0.30D 03	0.54455D-01	0.15620D 00	0.177223 00	0.177220 00	0.177220 00
0.400 03	0.32583D-01	0.140050 00	0.17288D 00	0.17288D 00	0.17288D 00
0.50D 03	0.19497D-01	0.125570 00	0.169660 00	0.169660 00	0.169660 00
0.600 03	0.11667D-01	0.11259D 00	0.167129 00	0.167120 00	0.167120 00
0.700 03	0.69315D-02	0.100950 00	0.16502D 00	0.165020 00	0.1653213 00
0.800 03	0.41775D-02	0.905080-01	0.161370 00	0.163250 00	0.16325D 00
0.900 03	0.24996D-02	0.81 1510-01	0.15898D 00	0.161710 00	0.161710 00
0.1CD 04	0.14961D-02	0.727610-01	0.156650 00	0.160370 00	0.16933 00
0.200 04	0.18069D-04	0.244390-01	0.13539D 00	0.152030 00	0.15203D 00
0.300 04	0.30653D-05	0.32169D-02	0.11704D 00	0.147530 03	0.147530 00
0.40D 04	0.27556D-05	0.276940-02	0.101180 00	0.14160D 00	0.144500 00
0.500 04	0.43354D-05	0.941110-03	0.874760-01	0.137070 00	0.142233 00
0.600 04	0.52715D-05	0.329610-03	0.75627D-01	0.132710 00	0.140430 00
0.703 04	0.55757D-05	0.126260-03	0.653650-01	0.12849D 00	0.138940 00
0.80D 04	0.55678D-05	0.58696D-04	0.565330-01	0.124400 00	0.13768D 00
0.503 04	0.54566D-05	0.35640D-04	0.48881D-01	0.120440 00	0.13658D 00
0.103 05	0.53343D-05	0.269750-04	0.422680-01	0.116610 00	0.135620 00
0.200 05	0.49595D-05	0.18428D-04	0.993460-02	0.84434D-01	0.125430 00
0.30D 05	0.49787D-05	0.20375D-04	0.240630-02	0.61173;-01	0.116650 00
0.405 05	0.49918D-05	0.20438D-04	0.65466D-03	0.44358D-01	0.10850D 00
0.50D 05	0.49970D-05	0.202170-04	0.24979D-03	0.322030-01	0.100920 00
0.600 05	0.49989D-05	0.200740-04	0.15685D-03	0.23417D-01	0.93888D-01
0.70D 05	0.49989D-05	0.200010-04	0.134700-03	0.170660-01	0.87353D-01
0.80D 05	0.49989D-05	0.199700-04	0.12624D-03	0.124740-01	0.81283D-01
0.900 05	0.49987D-05	0.19959D-04	0.12551D-03	0.91 555D-02	0.75644D-01
0.100 06	0.49993D-05	0.199600-04	0.12403D-03	0.675510-02	0.704063-01
0.200 06	0.49985D-05	0.199890-04	0.124930-03	0.741740-03	0.34704D-01
0.300 06	0.49977D-05	0.199920-04	0.125250-03	0.510779-03	0.17628D-01
0.40D 06	0.49974D-05	0.19990D-04	0.12500D-03	0.499000-03	0.946043-02
0.500 06	0.49969D-05	0.19988D-04	0.12487D-03	0.49674D-03	0.555310-02
0.600 06	0.49964D-05	0.199660-04	0.12482D-03	0.4966 1D-03	0.368360-02
0.700 06	0.49959D-05	0.19984D-04	0.124800-03	0.497160-03	0.27895D-02
0.800 06	0.49954D-05	0.19981D-04	0.124791)-03	0.49772D-03	0.23625D-02
0.90D 06	0.49949D-05	0.19980D-04	0.124780-03	0.49809D-03	0.2 1590D-02
0.1CD 07	0.49944D-05	0.19978D-04	0.124770-03	0.49826D-03	0.20622D-02
0.20D 07	0.49893D-05	0.19957D-04	0.124660-03	0.493550-03	0.19688D-02
0.300 07	0.49843D-05	0.199370-04	0.124540-03	0.49697D-03	0.19666D-02
0.403 07	0.49793D-05	01 99170-04	0.12441D-03	0.496473-03	0.19657D-02
0.50D 07	0.49742D-05	0.196970-04	0.124290-03	0.495980-03	0.196403-02
0.600 07	0.49692D-05	0.198770-04	0.12416D-03	0.495450-03	0.155200-02
0.70D 07	0.49642D-05	0.196570-04	0.124040-03	0.49499D-03	0.19600D-02
0.800 07	0.49592D-05	0.19837D-04	0.12391D-03	0.49449D-03	0.19579D-02
0.930 07	0.49542D-05	0.198170-04	0.123790-03	0.49400D-03	0.195590-02
0.10D 08	0.49492D-05	0.19797D-04	0.123660-03	0.493530-03	0.19539D-02
0.200 08	0.48994D-05	0.19598D-04	0.12242D-03	0.48856D-03	0.19345D-02
0.300 08	0.48502D-05	0.1 94010-04	0.121 19D-03	0.48366D-03	0.191 54D-02
0.400 06	0.48014D-05	0.192060-04	0.11 997D-03	0.476620-03	0.18964D-02
0.5CD 08	0.47532D-05	0.190130-04	0.118770-03	0.47402D-03	0.167760-02
0.600 08	0.47054D-05	0.188220-04	0.117570-03	0.469270-03	0.18590D-02
0.70D 06	0.46581D-05	0.186330-04	0.116390-03	0.464570-03	0.18405D-02
0.800 08	0.46113D-05	0.184450-04	0.115230-03	0.459910-03	0.182230-02
0.90D 08	0.45650D-05	0.18260D-04	0.114070-03	0.455300-03	0.18042D-02
0.100 09	0.45191D-05	0.160770-04	0.112920-03	0.45074D-03	0.17863D-02
0.20D 09	0.40849D-05	0.163400-04	0.10208D-03	0.40756D-03	0.16 1690-02
0.30D a9	0.36925D-05	0.147700-04	0.922790-04	0.36852D-03	0.14636D-02
0.400 09	0.33377D-05	0.13351 0-04	0.83419D-04	0.333229-03	0.13248D-02

t_D	100	200	500	1,000	2,000
0.50D 09	0.301 70D-05	0.12069D-04	0.75410D-04	0.30130D-03	0.11991D-02
0.60D 09	0.27272D-05	0.10909D-04	0.681690-04	0.27243D-03	0.10354D-02
0.703 09	0.246520-05	0.98612D-05	0.61624D-04	0.246340-03	0.98245D-03
0.80D 09	0.222830-05	0.89139D-05	0.55707D-04	0.222740-03	0.88927D-03
0.900 09	0.20142D-05	0.80576D-05	0.50359D-04	0.20140D-03	0.80493D-03
0.10D 10	0.18207D-05	0.72835D-05	0.45524D-04	0.18211D-03	0.72859D-03
0.200 10	0.6631 OD-06	0.265280-05	0.165910-04	0.665 27D-04	0.26899D-03
0.30D 10	0.241500-06	0.96621D-06	0.60463D-05	0.24304D-04	0.9931 2D-04
0.40D 10	0.87912D-07	0.351 75D-06	0.22025D-05	0.88746D-05	0.36650D-04
0.50D 10	0.31966D-07	0.12791D-06	0.801390-06	0.32369D-05	0.13511D-04
0.60D 10	0.11629D-07	0.465330-07	0.29171D-06	0.11811D-05	0.49814D-05
0.70D 10	0.42686D-08	0.17085D-07	0.10715D-06	0.435740-06	0.16508D-05
0.80D 10	0.161610-08	0.64690D-08	0.40587D-07	0.164910-06	0.706 75D-06
0.90D 10	0.65483D-09	0.262160-08	0.16442D-07	0.66856D-07	0.28702D-06
0.10D 11	0.29202D-09	0.11682D-08	0.73457D-08	0.29826D-07	0.12782D-06

t_D	4,000	10,000	∞
0.1 OD-01	0.98377D 00	0.983770 00	0.98377D 00
0.20D-01	0.80058D 00	0.80058D 00	0.800580 00
0.330-01	0.71620D 00	0.71620D 00	0.716200 00
0.40D-01	0.664400 00	0.66440D 00	0.664400 00
0.50D-01	0.629160 00	0.62818D 00	0.628180 00
C.60D-01	0.60088D 00	0.60088D 00	0.60088D 00
0.70D-01	0.57928D 00	0.579280 00	0.579280 00
0.80D-01	0.56157D 00	0.56157D 00	0.56157D 00
0.90D-01	0.545680 00	0.54668D 00	0.54668D 00
0.10D 00	0.533920 00	0.533920 00	0.53392D 00
0.20D 00	0.461 14D .00	0.461140 00	0.461140 00
0.30D 00	0.42610D 00	0.426100 00	0.42610D 00
0.400 00	0.40398D 00	0.403980 00	0.40398D 00
0.50D 00	0.38818D 00	0.398180 00	0.38818D 00
0.60D 00	0.37608D 00	0.376060 00	0.37608D 00
0.700 00	0.366370 00	0.366379 00	0.36637D 00
0.80D 00	0.358310 00	0.358323 00	0.35832D 00
0.90D 00	0.351480 00	0.35148D 00	0.35148D 00
0.109 01	0.34556D 00	0.34556D 00	0.34556D 00
0.200 01	0.310800 00	0.310800 00	0.310800 00
0.300 01	0.29334D 00	0.293340 00	0.29334D 00
0.40D 01	0.28203D 00	0.28203D 00	0.282030 00
0.50D 01	0.273510 00	0.27381D 00	0.27381D 00
0.60D 01	0.267430 00	0.26743D 00	0.267430 00
0.700 01	0.26225D 00	0.26225D 00	0.26225D 00
0.80D 01	0.25791D 00	0.25791D 00	0.25791D 00
0.90D 01	0.254200 00	0.25420D 00	0.254200 00
0.10D 02	0.25096D 00	0.25096D 00	0.25096D 00
0.20D 02	0.231510 00	0.23151D 00	0.23151D 00
0.300 02	0.22142D 00	0.22142D 00	0.221420 00
0.40D 02	0.2147613 00	0.21476D 00	0.21476D 00
0.50D 02	0.205860 00	0.20986D 00	0.209950 00
0.600 02	0.206010 00	0.20601D 00	0.20601D 00
0.700 02	0.20287D 00	0.20287D 00	0.202870 00
0.80D 02	0.20021D 00	0.20021D 00	0.20021D 00
0.908 02	0.19793D 00	0.197930 00	0.19793D 00
0.103 03	0.195930 00	0.195930 00	0.195930 00
0.20D 03	0.183700 00	0.183700 00	0.18370D 00
0.330 03	0.17722D 00	0.177220 00	0.17722D 00
0.400 03	0.17288D 00	0.17288D 00	0.172880 00
0.50D 03	0.16966D 00	0.169660 00	0.163660 00
0.60D 03	0.16712D 00	0.167129 00	0.167120 00
0.70D 03	0.165020 00	0.16502D 00	0.16502D 00
0.80D 03	0.16325D 00	0.16325D 00	0.16325D 00
0.900 03	0.16171D 00	0.161710 00	0.161710 00
0.10D C4	0.16037D 00	0.160370 00	0.16037D 00
0.20D 04	0.15203D 00	0.15203D 00	0.152030 00

t_D	4,000	10,000	∞
0.300 04	0.147530 00	0.14753D 03	0.14753D 00
0.400 04	0.144500 00	0.144500 00	0.14450D 00
0.500 04	0.142230 00	'0.142230 00	0.14223D 00
0.600 04	0.140430 00	0.145430 00	0.14043D 00
0.700 04	0.138940 00	0.13894D 00	0.13894D 00
0.800 04	0.137680 00	0.137680 00	0.13768D 00
0.900 04	0.136530 00	0.13658D 00	0.13658D 00
0.10D 05	0.13562D 00	0.13562D 0C	0.13562D 00
0.200 05	0.129593 00	0.12959D 00	0.12959D 00
0.300 05	0.126310 00	0.126310 00	0.12631D 00
0.40D 05	0.124060 00	0.12408D 00	0.12408D 00
0.500 05	0.122410 00	0.122410 00	0.12241D 00
0.60D 05	0.119510 00	0.121070 00	0.12107D 00
0.700 05	0.117540 00	0.11997D 00	0.11997D 00
0.80D 05	0.115620 00	0.11903D 00	0.11903D 00
0.90D 05	0.113740 00	0.118220 00	0.11822D 00
0.100 06	0.111900 00	0.117502 00	0.11750D 00
0.200 06	0.95120D-01	0.113000 00	0.11300D 00
0.300 06	0.810410-01	0.11055D 00	0.11055D 00
0.40D 06	0.69225D-01	0.107440 00	0.10890D 00
0.500 06	0.593090-01	0.10504D 00	0.10766D 00
0.600 06	0.50987D-01	0.102720 00	0.10668D 00
0.700 06	0.440030-01	0.100490 00	0.10587D 00
0.800 06	0.38141D-01	0.983330-01	0.10519D 00
0.90D 06	0.332220-01	0.962450-01	0.10461D 00
0.10D 07	0.29093D-01	0.94227D-01	0.10409D 00
0.203 07	0.112739-01	0.77368D-01	0.10100D 00
0.300 07	0.817700-02	0.653150-01	0.99455D-01
0.409 07	0.76368D-02	0.566970-01	0.98496D-01
0.50D 07	0.75386D-02	0.50532D-01	0.97838D-01
0.600 07	0.751520-02	0.461210-01	0.97361D-01
0.70D 07	0.750410-02	0.42962D-01	0.97000D-01
0.80D 07	0.749530-02	0.40698D-01	0.96721D-01
0.90D 07	0.748740-02	0.39073D-01	0.96500D-01
0.10D 08	0.74800D-02	'0.379053-01	0.96322D-01
0.203 08	0.741060-02	0.348[illegible]6D-01	0.95578D-01
0.30D 08	0.734030-02	0.34555D-01	0.95394D-01
0.400 03	0.727060-02	0.343065-01	0.95315D-01
0.500 08	0.72016D-02	0.34063D-01	0.95260D-01
0.60D 08	0.713330-02	0.33822D-01	0.95213D-01
0.700 08	0.706570-02	0.335830-01	0.95168D-01
0.830 08	0.699870-02	0.33346D-01	0.95123D-01
0.900 03	0.693230-02	0.331 10D-01	0.95079D-01
0.10D 09	0.686660-02	0.32876D-01	0.95036D-01
0.200 09	0.62427D-02	0.30624D-01	0.94612D-01
0.30D 09	0.56755D-02	0.28526D-01	0.94210D-01
0.430 09	0.51 598D-02	0.265720-01	0.93828D-01
0.500 09	0.4691 00-02	0.247520-01	0.93466D-01
0.600 09	0.426470-02	0.230570-01	0.93122D-01
0.703 09	0.38772D-02	0.214760-01	0.92795D-01
0.80D 09	0.352490-02	0.203070-01	0.92484D-01
0.900 OF	0.320460-02	0.18637D-01	0.92187D-01
0.10D 10	0.29135D-02	0.1 7360D-01	0.91904D-01
0.200 10	0.11239D-02	0.85410D-02	0.89670D-01
0.300 10	0.433540-03	0.420270-02	0.88157D-01
0.400 10	0.1671 90-03	0.20682D-02	0.87057D-01
0.530 10	0.644170-04	0.101770-02	0.86211D-01
0.600 10	0.248080-04	0.500600-03	0.85530D-01
0.70D 10	0.959500-05	0.24611D-03	0.84963D-01
0.80D io	0.37780D-05	0.123960-03	0.84479D-01
0.900 10	0.155500-05	0.595960-04	0.84057D-01
0.100 11	0.690290-06	0.295540-04	0.83684D-01

q_D FOR DIFFERENT **VALUES** OF r_{eD} ($\omega = 0.1$, $\lambda = 10^{-6}$)

t_D	r_{eD} = 10	20	50	100	200
0.1 OD-01	0.22488D 01	0.224880 01	0.22488D 01	0.224890 01	0.22488D 01
0.20D-01	0.17152D 01	0.17152D 01	0.171523 01	0.171520 01	0.17152D 01
0.300-01	0.147630 01	0.14763D 01	0.147630 01	0.147630 01	0.14763D 01
0.403-01	0.13325D 01	0.13325D 01	0.133250 01	0.133250 01	0.13325D 01
0.50D-01	0.12336D 01	0.12336D 01	0.123360 01	0.123360 01	0.123360 01
0.60D-01	0.11600D 01	0.116000 01	0.11600D 01	0.11600D 01	0.11600D 01
0.70D-01	0.110250 01	0.11025D 01	0.110250 01	0.110250 01	0.110250 01
0.80D-01	0.10558D 01	0.105589 01	0.10558D 01	0.10558D 01	0.10558D 01
0.90D-01	0.10169D 01	0.10169D 01	0.10169D 01	0.10169D 01	0.10169D 01
0.10D 00	0.98377D 00	0.98377D 00	0.983770 00	0.98377D 00	0.98377D 00
0.200 00	0.80058D 00	0.80058D 00	0.800580 00	0.80058D 00	0.80058D 00
0.300 00	0.71620D 00	0.716200 00	0.716200 00	0.71620D 00	0.71620D 00
0.403 00	0.66440D 00	0.664400 OU	0.664400 00	0.66440D 00	0.664400 00
0.50D 00	0.52818D 00	0.62818D 00	0.628130 00	0.528180 00	0.628180 00
0.600 00	0.60089D 00	0.60089D 00	0.600890 00	0.60089D 00	0.60089D 00
0.70D 00	0.579280 00	0.579260 00	0.579263 00	0.579280 00	0.57928D 00
0.80D 00	0.56157D 00	0.561570 00	0.56157D 00	0.56157D 00	0.561570 00
0.900 03	0.54669D 00	0.546690 00	0.546690 00	0.546690 00	0.546690 00
0.10D 01	0.53392D 00	0.53392D 00	0.533920 00	0.533920 00	0.53392D 00
0.20D 01	0.46114D 00	0.461140 00	0.461140 00	0.461140 00	0.46114D 00
0.300 01	0.42611D 00	0.42611D 00	0.42611D 00	0.426110 00	0.42611D 00
0.40D 01	0.35468D 00	0.403960 00	0.40398D 00	0.40398D 00	0.40398D 00
0.50D 01	0.31406D 00	0.38819D 00	0.38819D 00	0.38819D 00	0.38819D 00
0.600 01	0.278100 00	0.37608D 00	0.37608D 00	0.376080 00	0.376080 00
0.703 01	0.24626D 00	0.36637D 00	0.366370 00	0.366370 00	0.36637D 00
0.80D 01	0.21807D 00	0.358320 00	0.358320 00	0.358320 00	0.358320 00
0.90D 01	0.19311D 00	0.35149D 00	0.351490 03	0.35149D 00	0.351490 00
0.100 02	0.171000 00	0.34557D 00	0.34557D 00	0.34557D 00	0.345570 00
0.20D 02	0.50723D-01	0.272830 00	0.31081D 00	0.31081D 00	0.31081D 00
0.303 02	0.15067D-01	0.219781) 00	0.293360 00	0.293360 00	0.293360 00
0.40D 02	0.449390-02	0.17705D 00	0.28205D 00	0.262050 00	0.282050 00
0.50D 02	0.135490-02	0.142640 00	0.27384D 00	0.27384D 00	0.27384D 00
0.600 02	0.44432D-03	0.11492D 00	0.26746D 00	0.26746D 00	0.267460 00
0.70D 02	0.1 74893-03	0.92596D-01	0.262280 00	0.26228D 00	0.26228D 00
0.80D 02	0.94357D-04	0.746 17D-01	0.251700 00	0.25795D 00	0.25795D 00
0.90D 02	0.67668D-04	0.601360-01	0.24542D 00	0.25424D 00	0.25424D 00
0.10D 03	0.56466D-04	0.48473D-01	0.23934D 00	0.251010 00	0.251011) 00
0.200 03	0.471 14D-04	0.573939-02	0.18659D 00	0.23157D 00	0.23157D 00
0.300 03	0.50807D-04	0.83506D-03	0.145550 00	0.221510 00	0.221510 00
0.40D 03	0.503790-04	0.27966D-03	0.11360D 00	0.207200 00	0.21488D 00
0.50D 03	0.49809D-04	0.21382D-03	0.88718D-01	0.19685D 00	0.21000D 00
0.600 03	0.49523D-04	0.201150-03	0.69349D-01	0.18705D 00	0.20517D 00
0.70D 03	0.49396D-04	0.196355-03	0.54269D-01	0.177760 00	0.20305D 00
0.800 03	0.49361D-04	0.19484D-03	0.42528D-01	0.16894D 00	0.200410 00
0.90D 03	0.49354D-04	0.19507D-03	0.33387D-01	0.16057D 00	0.198150 00
0.100 04	0.49357D-04	0.19605D-03	0.262700-01	0.152630 00	0.196170 00
0.200 04	0.49377D-04	0.19985D-03	0.32871D-02	0.924082-01	0.17477D 00
0.30D 04	0.49332D-04	0.19692D-03	0.14118D-02	0.56736D-01	0.15719D 00
0.430 04	0.492780-04	0.19850D-03	0.12593D-02	0.35603D-01	0.14159D 00
0.500 04	0.49223D-04	0.19826D-03	0.124140-02	0.23084D-01	0.127750 00
0.600 04	0.49169D-04	0.19806D-03	0.12354D-02	0.156550-01	0.115450 00
0.700 04	0.49114D-04	0.19785D-03	0.12328D-02	0.11267D-01	0.10454D 00
0.80D 04	0.490590-04	0.19764D-03	0.12318D-02	0.86597D-02	0.94851D-01
0.90D 04	0.49004D-04	0.197430-03	0.12314D-02	0.71 128D-02	0.86 249D-01
0.10D 05	0.48950D-04	0.197210-03	0.123099-02	0.61 943D-02	0.786 13D-01
0.200 05	0.48409D-04	0.195 050-03	0.12188D-02	0.48301D-02	0.36529D-01
0.30D 05	0.47875D-04	0.192900-03	0.12050D-02	0.47647D -02	0.23627D-01
0.400 05	0.47346D-04	0.19077D-03	0.1191 7D-02	0.471 30D-02	0.19582D-01
0.530 05	0.46822D-04	0.18866D-03	0.11 786D-02	0.46635D-02	0.18231D-01
0.60D 05	0.46305D-04	0.18657D-03	0.116563-02	0.46 137D-02	0.1 7699D-01
0.700 C5	0.45793D-04	0.18451 D-03	0.11528D-02	0.45640D-02	0.17413D-01
0.80D 05	0.45287D-04	0.18248D-03	0.114010-02	0.45145D-02	0.1 7207D-01
0.90D 05	0.44787D-04	0.18046D-03	0.11 276D-02	0.44654D-02	0.17022D-01
0.10D 06	0.44292D-04	0.17847D-03	0.11 152D-02	0.44169D-02	0.16846D-01
0.20D 06	0.39635D-04	0.15971D-03	0.99833D-03	0.39604D-02	0.15212D-01
0.30D 06	0.35467D-04	0.142920-03	0.89373D-03	0.35514D-02	0.13741D-01
0.40D 06	0.31 736D-04	0.12790D-03	0.80010D-03	0.31 847D-02	0.124120-01
0.500 06	0.28400D-04	0.11445D-03	0.71 627D-03	0.28558D-02	0.11210D-01
0.60D 06	0.2541 4D-04	0.1 0242D-03	0.641231)-03	0.256053-02	0.101 23-01
0.70D 06	0.22742D-04	0.91 655D-04	0.57405D-03	0.229640-02	[illegible]

t_D	10	20	50	100	200
0.800 06	0.20350D-04	0.82021D-04	0.513900-03	0.205920-02	0.82607D-02
0.900 06	0.18210D-04	0.733990-04	0.46006D-03	0.18466D-02	0.74613D-02
0.100 07	0.162950-04	0.55684D-04	0.411860-03	0.165590-02	0.67393D-02
0.200 07	0.536500-05	0.21634D-04	0.1 3618D-03	0.55671D-03	0.24359D-02
0.300 07	0.176620-05	0.712519-05	0.45025D-04	0.1871 6D-03	0.88047D-03
0.400 07	0.58094D-06	0.23446D-05	0.14874D-04	0.62874D-04	0.313110-03
0.500 07	0.19058D-06	0.77067D-06	0.490810-05	0.21 097D-04	0.114810-03
0.600 07	0.62992D-07	0.25442D-06	0.16262D-05	0.71 0200-05	0.414620-04
0.700 07	0.2 13090-07	0.861020-07	0.551960-06	0.244070-05	0.151 220-04
0.800 07	0.77113D-08	0.311740-07	0.20002D-06	0.88893D-06	0.5701 70-05
0.900 07	0.31226D-08	0.126200-07	0.809900-07	0.359430-06	0.23076D-05
0.100 08	0.13818D-08	0.55650D-08	0.35948D-07	0.160040-06	0.10298D-05

t_D	500	1,000	2,000	4,000	10,000
0.10D-01	0.224883 01	0.224860 01	0.224883 01	0.224880 01	0.224830 01
0.200-01	0.171520 01	0.171520 01	0.171520 01	0.171520 01	0.17152D 01
0.300-01	0.147630 01	0.147630 01	0.14763D 01	0.147630 01	0.14763D 01
0.40D-01	0.133250 01	0.133250 01	0.133250 01	0.133250 01	0.133250 01
0.50D-01	0.123360 01	0.123360 01	0.12336D 01	0.123360 01	0.12336D 01
0.600-01	0.11600D 01	0.116000 01	0.116000 01	0.116000 01	0.11600D 01
0.70D-01	0.110250 01	0.110250 01	0.110250 01	0.110250 01	0.11025D 01
0.80D-01	0.105560 01	0.105580 01	0.105560 01	0.10558D 01	0.'0558D 01
0.90D-01	0.101690 01	0.101690 01	0.101690 01	0.101690 01	0.101691) 01
0.100 00	0.98377D 00	0.98377D 00	0.98377D 00	0.983770 00	0.783770 00
0.200 00	0.80058D 00	0.80058D 00	0.800580 00	0.80058D 00	0.80058D 00
0.300 00	0.716200 00	0.71620D 00	0.716230 00	0.716200 00	0.716200 00
0.40D 00	0.664400 00	0.66440D 00	0.664400 00	0.664400 00	0.664400 00
C.500 00	0.62818D 00	0.628160 00	0.62818D 00	0.628180 00	0.62818D 00
0.60D 00	0.60089D 00	0.60089D 00	0.60089D 00	0.600890 00	0.60089D 00
0.700 00	0.57928D 00	0.579230 00	0.579280 00	0.57928D 00	0.57928D 00
0.800 00	0.551570 00	0.561570 00	0.561570 00	0.561570 00	0.561570 00
0.90D 00	0.545690 00	0.546690 00	0.546690 00	0.546690 00	0.546690 00
0.100 01	0.53392D 00	0.53392D 00	0.533920 00	0.533920 00	0.533920 00
0.200 01	0.461140 00	0.461140 00	0.46114D 00	0.461140 00	0.461140 00
0.300 01	0.426110 00	0.426110 00	0.426110 00	0.426110 00	0.426110 00
0.40D 01	0.40398D 00	0.403980 00	0.403931) 00	0.40398D 00	0.40398D 03
0.500 01	0.38819D 00	0.38819D 00	0.383190 00	0.388190 00	0.38819D 00
0.600 01	0.376090 00	0.376050 00	0.37608D 00	0.376060 00	0.376030 C0
0.70D 01	0.356370 00	0.366375 00	0.36637D 00	0.36637D 00	0.366370 00
0.80D 01	0.358329 00	0.358320 00	0.35832D 00	0.353320 00	0.35832D 00
0.900 01	0.351493 00	0.351490 00	0.351490 00	0.351490 00	0.351490 00
0.103 02	0.34557D 00	0.345570 00	0.34557D 00	0.345570 00	0.34557D 00
0.200 02	0.310810 00	0.31081D 00	0.31081D 00	0.310810 00	0.31081D 00
0.300 02	0.29336D 00	0.29336D 00	0.293360 00	0.233360 00	0.293360 00
0.400 02	0.28205D 00	0.282050 00	0.282050 00	0.282053 00	0.282050 00
0.50D 02	0.27384D 00	0.27384D 00	0.27384D 00	0,273840 00	0.273840 00
0.600 02	0.267400 00	0.26746D 00	0.267460 00	0.267460 00	0.267460 00
0.700 02	0.26228D 00	0.262280 00	0.26228D 00	0.26228D 00	0.26228D 00
0.800 02	0.25795D 00	0.257950 00	0.257955 00	0.25795D 00	0.257950 00
0.900 02	0.254240 00	0.254240 00	0.254240 00	0.234240 00	0.254240 00
0.10D 03	■ 0.25101D 00	0.251010 00	0.251010 00	0.251310 00	0.25101D 00
0.200 03	0.23157D 00	0.231570 00	0.231973 00	0.23157D 00	0.23157D 00
0.300 03	0.221518 00	0.221510 00	0.221510 00	0.221510 00	0.221510 00
0.400 03	0.214880 00	0.21488D 00	0.21488D 00	0.21488D 00	0.21488D 00
0.503 03	0.210000 00	0.21000D 00	0.21000D 00	0.210000 00	0.213300 00
0.60D 03	0.206170 00	0.20617D 00	0.206173 C0	0.20617D 00	0.206170 00
0.700 03	0.20305D 00	0.203030 00	0.203950 03	0.233050 00	0.20305D 00
0.80D 03	0.20041D 00	0.200410 00	0.20041D 00	3.20041D 00	0.200410 00
0.90D 03	0.19815D 00	0.193150 00	0.198150 00	0.198150 00	0.198153 00
0.10D 04	0.19617D 00	0.19617D 00	0.196170 00	0.196170 00	0.19617D 00
0.20D 04	0.184110 00	0.184110 00	0.184110 00	0.134115 00	0.18411D 00
0.300 04	0.17779D 00	0.17779D 00	0.17779D 00	0.177798 00	0.17779D 00
0.40D 04	0.173630 00	0.173600 00	0.17360D 00	0.17360D 00	0.173600 00
0.50D 04	0.170520 00	0.170520 00	0.170520 00	0.170520 00	0.17052D 00
0.600 04	0.168110 00	0.166110 00	0.16811D 00	0.168110 00	0.168110 00
0.700 04	0.166140 00	0.166140 00	0.166140 00	0.16614D 00	0.166140 00
0.80D 04	0.162730 00	0.164490 00	0.16449D 00	0.164490 00	0.16449D 00
0.90D 04	0.16053D 00	0.163080 00	0.163080 03	0.16303D 00	0.16308D 00
0.100 05	0.158420 00	0,161860 00	0.16186D 00	0.16186D 00	0.161800 00
0.200 OS	0.140050 00	0.154600 00	0.154600 00	0.15460D 00	0.154605 00
0.30D 05	0.125670 00	0.15106D 00	0.151060 00	0.151050 00	0.151060 00
0.40D 05	0.114360 00	0.146730 00	0.146870 00	0.14387D 33	0.14687D 00

t_D	500	1,000	2,000	4,000	10,000
0.505 05	0.10545D 00	0.14378D 00	0.14737D 00	0.14737D 00	0.14737D 00
0.60D 05	0.98407D-01	0.1411.9D 00	0.14628D 00	0.14628D 00	0.14628D 00
0.70D 05	0.92818D-01	0.13890D 00	0.145440 00	0.14544D 00	0.145440 00
0.80D 05	0.8836 1D-01	0.13686D 00	0.14478D 00	0.144729 00	0.144753 00
0.90D 05	0.84787D-01	0.13505D 00	0.144240 00	0.14424D 00	0.14424D 00
0.100 06	0.81901D-01	0.133430 00	0.143793 00	0.143793 00	0.14375.D 00
0.20D 06	0.69508D-01	0.12375D 00	0.14038D 00	0.14146D 00	0.14146D 00
0.30D 06	0.64544D-01	0.11900D 00	0.136510 00	0.14027D 00	0.14027D 00
0.40D 06	0.60437D-01	0.11553D 00	0.13705D 00	0.139300 00	0.13930D 00
0.500 06	0.56631 0-01	0.11243D 00	0.13574D 00	0.13843D 00	0.13843D 00
0.600 06	0.53069D-01	0.10949D 00	0.134510 00	0.13757D 00	0.13761D 00
0.70D 06	0.49732D-01	0.106650 00	0.13332D 00	0.136793 00	0.13685D 00
0.80D 06	0.46606D-01	0.10390D 00	0.13217D 00	0.136050 0C	0.13612D 00
0.900 06	0.43677D-01	0.101220 00	0.13105D 00	0.13534D 00	0.13543D 00
0.10D 07	0.40 3330-01	0.9661 3-01	0.12995D 00	0.13468D 00	0.13478D 00
0.20D 07	0.21402D-01	0.76127D-01	0.120160 00	0.12943D 00	0.12979D 00
0.30D 07	0.11 198D-01	0.58888D-01	0.11173 00	0.12578D 00	0.126559 00
0.40D 07	0.59613D-02	0.45595D-01	0.10413D 00	0.12293D 00	0.12426D 00
0.50D 07	0.306870-02	0.3531 7D-01	0.97147D-01	0.120500 00	0.122533 00
0.60D 07	0.16065D-02	0.273610-01	0.90670D-01	0.11831D 00	0.12116D 00
0.70D 07	0.84072D-03	0.21 199D-01	0.84641D-01	0.11626D 00	0.12002D 00
0.80D 07	0.43980D-03	0.16425D-01	0.7901 93-01	0.11431D 00	0.11906D 00
0.90D 07	0.23014D-03	0.12727D-01	0.73772D-01	0.112420 00	0.11822D 00
0.100 08	0.12070D-03	0.98612D-02	0.688740-01	0.11057D 00	0.11748D 00
0.20D 08	0.36961D-06	0.76749D-03	0.34656D-01	0.93906D-01	0.11270D 00
0.30D 08		0.61284D-04	0.174380-01	0.79775D-01	0.10962D 00
0.40D 08		0.68327D-05	0.87748D-02	0.6 7771D-01	0.10696D 00
0.50D 08		0.79889D-06	0.441 49D-02	0.57573D-01	0.10445D 00
0.60D 06			0.22205D-02	0.48910D-01	0.10201D 00
0.700 08			0.11161D-02	0.41550D-01	0.99634D-01
0.80D 08			0.56088D-03	0.35298D-01	0.97315D-01
0.90D 08			0.28218D-03	0.29986D-01	0.95050D-01
0.10D 09			0.14264D-03	0.25474D-01	0.92038D-01
0.20D 09				0.49872D-02	0.73361 D-01
0.30D 09				0.97473D-03	0.579700-01
0.40D OF				0.19085D-03	0.45809D-01
0.50D 09				0.39286D-04	0.361 98D-01
0.60D 09				0.96865D-05	0.28604D-01
0.70D 09				0.29027D-05	0.22603D-01
0.80D 09				0.50701D-06	0.17861D-01

$r_{eD} = \infty$

t_D	q_D
0. f 0D-01	0.22488D 01
0.20D-01	0.171520 01
0.333-01	0.14763 01
0.40D-01	0.13325D 01
0.50D-01	0.12336D 01
0.60D-01	0.11600D 01
0.700-01	0.110250 01
0.80D-01	0.105590 01
0.500-01	0.10169D 01
0.10D 00	0.98377D 00
0.20D 00	0.80053D 00
0.30D 00	0.71620D 00
0.40D 00	0.66440D 00
0.50D 00	0.628160 00
0.60D 00	0.60089D 00
0.70D 00	0.57928D 00
0.800 00	0.56157D 00
0.90D 00	0.54669D 00
0.10D 01	0.53392D 00
0.200 01	0.461140 00
0.303 01	0.42611D 00
0.40D 01	0.40398D 00
0.50D 01	0.38819D 00
0.60D 01	0.37606D 00
0.70D 01	0.36637D 00
0.80D 01	0.35832D 00
0.90D 01	0.351495 00
0.10D 02	0.345579 00
0.200 02	0.31081D 00
0.30D 02	0.29336D 00
0.40D 02	0.28205D 00

t_D	q_D
0.50D 02	0.273840 0C
0.60D 02	0.26746D 00
0.70D 02	0.262280 00
0.600 02	0.257950 00
0.90D 02	0.254249 00
0.10D 03	0.251010 00
0.20D 03	0.23157D 00
0.30D 03	0.2215113 00
0.40D 03	0.21488D 00
0.500 03	0.21000D 00
0.600 03	0.200170 00
0.70D 03	0.20305D 00
0.80D 03	0.20041D 00
0.90D 03	0.1961513 00
0.10D 04	0.19617D 00
0.20D 04	0.184110 00
0.300 04	0.177790 00
0.400 04	0.17360D 00
0.50D 04	0.17052D 00
0.60D 04	0.168110 00
0.70D 04	0.166140 00
0.80D 04	0.16449D 00
0.900 04	0.16305D 00
0.10D 05	0.16186D 00
0.200 05	0.154608 00
0.30D 05	0.15106D 00
0.40D 05	0.14887D 00
0.50D 05	0.14737D 00
0.60D 05	0.14628D 00

t_D	q_D
0.700 05	0.145441) 00
0.80D 05	0.144780 00
0.90D 05	0.144240 00
0.10D 06	0.143798 00
0.20D 06	0.1414613 00
0.30D 06	0.14027D 00
0.40D 06	0.'3930D 00
0.50D 06	0.13843D 00
0.600 06	0.:3761D 00
0.70D 06	0.13685D 00
0.80D 06	0.13612D 00
0.90D 06	0.135430 00
0.10D 07	0.13478D 00
0.20D 07	0.12979D 00
0.30D 07	0.12655D 00
0.40D 07	0.12426D 00
0.50D 07	0.12253D 00
0.60D 07	0.12116D 00
0.70D 07	0.12002D 00
0.80D 07	0.11906D 00
0.90D 07	0.11823D 00
0.10D 08	0.117490 00
0.20D 08	0.11289D 00
0.30D 08	0.11037D 00
0.40D 08	0.10865D 00
0.50D 08	0.10735D 00
0.60D 08	0.106310 00
0.70D 08	0.105450 00
0.80D 08	0.104720 00
0.90D 08	0.10408D 00

t_D	q_D
0.10D 09	0.10351D 00
0.20D 09	0.99944D-01
0.30D 09	0.97968D-01
0.400 09	0.9661 2D-01
0.50D 09	0.95586D-01
0.600 09	0.94764D-01
0.700 09	0.94079D-01
0.800 09	0.93494D-01
0.90D 09	0.92984D-01
0.10D 10	0.92533D-01
0.20D 10	0.89668D-01
0.30D 10	0.88073D-01
0.40D 10	0.86975D-01
0.50D 10	0.86142D-01
0.600 10	0.85473D-01
0.700 10	0.84916D-01
0.80D 10	0.84439D-01
0.90D 10	0.84022D-01
0.100 11	0.83653D-01

C.3 INTERFERENCE

The tabulated solutions for the dimensionless fracture pressure, p_{fD}, and the dimensionless matrix pressure, p_{mD}, as a function of t_D/r_D^2 are presented for the following values of θ, λ, and ω.

p_{fD}	
w	θ
0.1	10
	1
	0.1
	0.01
	0.001
	0.0001
0.01	10
	1
	0.1
	0.01
	0.001
	0.001
0.001	10
	0.1
	0.01
	0.001
	0.0001
	1

p_{mD}	
λ	ω
10^{-5}	0.1
	0.01
	0
10^{-6}	0.1
	0.01
	0
10^{-7}	0.1
	0.01
	0
10^{-9}	0.1
	0.01
	0
10^{-10}	0.1
	0.01
	0

p_{fD} VS t_D/r_D^2 (ω = 0.1)

t_D/r_D^2	θ = 10	θ = 1	θ = 0.1
0.1D-01	0.5791D-02	0.1151D-01	1236D-01
0.2D-01	0.2085D-01	0.6365D-01	0.7218D-01
0.3D-01	0.3059D-01	0.1208D 00	0.1435D 00
0.4D-01	0.3747D-01	0.1704D 00	0.2109D 00
0.5D-01	0.4346D-01	0.2116D 00	0.27190 00
0.6D-01	0.4923D-01	0.2457D 00	0.32650 00
0.7D-01	0.5498D-01	0.2740D 00	0.3756D 00
0.8D-01	0.6078D-01	0.2977D 00	0.42000 00
0.9D-01	0.6663D-01	0.3178D 00	0.46030 00
0.1D 00	0.7253D-01	0.3349D 00	0.4972D 00
0.2D 00	0.1332D 00	0.4261D 00	0.7481D 00
0.3D 00	0.1940D 00	0.4686D 00	0.8920D 00
0.4D 00	0.2525D 00	0.5007D 00	0.9877D 00
0.5D 00	0.3075D 00	0.5297D 00	0.1057D 01
0.6D 00	0.3590D 00	0.5572D 00	0.1109D 01
0.7D 00	0.4068D 00	0.5836D 00	0.11503) 01
0.8D 00	0.4512D 00	0.6092D 00	0.1183D 01
0.9D 00	0.4926D 00	0.6339D 00	0.1210D 01
0.1D 01	0.5312D 00	0.6578D 00	0.1233D 01
0.2D 01	0.8141D 00	0.8616D 00	0.13510 01
0.3D 01	0.9958D 00	0.1017D 01	0.1409D 01
0.4D 01	0.1129D 01	0.1140D 01	0.1455D 01
0.5D 01	0.1234D 01	0.1241D 01	0.1496D 01
0.6D 01	0.1321D 01	0.1325D 01	0.1535D 01
0.7D 01	0.1395D 01	0.1398D 01	0.1572D 01
0.8D 01	0.1460D 01	0.1462D 01	0.1607D 01
0.9D 01	0.1517D 01	0.1519D 01	0.1641D 01
0.1D 02	0.1568D 01	0.1569D 01	0.1673D 01
0.2D 02	0.1909D 01	0.1909D 01	0.1933D 01
0.3D 02	0.2109D 01	0.2109D 01	0.21173) 01
0.4D 02	0.2252D 01	0.2252D 01	0.2255D 01
0.5D 02	0.2363D 01	0.2363D 01	0.2364D 01
0.6D 02	0.2454D 01	0.2454D 01	0.2454D 01
0.7D 02	0.25310 01	0.2531D 01	0.2531D 01
0.8D 02	0.2597D 01	0.2597D 01	0.2597D 01
0.9D 02	0.2656D 01	0.2656D 01	0.2656D 01
0.1D 03	0.2708D 01	0.2708D 01	0.2709D 01
0.2D 03	0.3054D 01	0.3054D 01	0.3054D 01
0.3D 03	0.3257D 01	0.3257D 01	0.32573) 01
0.4D 03	0.3401D 01	0.3401D 01	0.3401D 01
0.5D 03	0.3512D 01	0.3512D 01	0.3512D 01
0.6D 03	0.3603D 01	0.3603D 01	0.3603D 01
0.7D 03	0.3680D 01	0.3680D 01	0.3680D 01
0.8D 03	0.3747D 01	0.3747D 01	0.3747D 01
0.9D 03	0.3806D 01	0.3806D 01	0.3806D 01
0.1D 04	0.3859D 01	0.3859D 01	0.3859D 01
0.2D 04	0.4205D 01	0.4205D 01	0.4205D 01
0.3D 04	0.4408D 01	0.4408D 01	0.4408D 01
0.4D 04	0.4552D 01	0.4552D 01	0.4552D 01
0.5D 04	0.4663D 01	0.4663D 01	0.4663D 01
0.6D 04	0.47548 01	0.47543) 01	0.4754D 01
0.7D 04	0.4831D 01	0.4831D 01	0.4831D 01
0.8D 04	0.4898D 01	0.4898D 01	0.4898D 01
0.9D 04	0.4957D 01	0.4957D 01	0.4957D 01

ω = 0.1

t_D/r_D^2	e = 0.01	e = 0.001	e = 0.0001
0.1D-01	0.1245D-01	0.1246D-01	0.1246D-01
0.2D-01	0.7310D-01	0.7320D-01	0.7321D-01
0.3D-01	0.1460D 00	0.1463D 00	0.1463D 00
0.4D-01	0.2156D 00	0.2161D 00	0.2161D 00
0.5D-01	0.2791D 00	0.2798D 00	0.2799D 00
0.6D-01	0.3365D 00	0.3375D 00	0.3376D 00
0.7D-01	0.3885D 00	0.3899D 00	0.3900D 00
0.8D-01	0.4360D 00	0.4376D 00	0.4378D 00
0.9D-01	0.4795D 00	0.4815D 00	0.4816D 00
0.1D 00	0.5196D 00	0.5219D 00	0.5221D 00
0.2D 00	0.8050D 00	0.8110D 00	0.8116D 00
0.3D 00	0.9835D 00	0.9935D 00	0.9945D 00
0.4D 00	0.1113D 01	0.1127D 01	0.1128D 01
0.5D 00	0.1214D 01	0.1232D 01	0.1234D 01
0.6D 00	0.1296D 01	0.1318D 01	0.1321D 01
0.7D 00	0.1366D 01	0.1392D 01	0.1395D 01
0.8D 00	0.1426D 01	0.1456D 01	0.1459D 01
0.9D 00	0.1478D 01	0.1513D 01	0.1517D 01
0.1D 01	0.1525D 01	0.1564D 01	0.1568D 01
0.2D 01	0.1820D 01	0.1899D 01	0.1908D 01
0.3D 01	0.1978D 01	0.2095D 01	0.2108D 01
0.4D 01	0.2081D 01	0.2233D 01	0.2250D 01
0.5D 01	0.2154D 01	0.2339D 01	0.2361D 01
0.6D 01	0.2208D 01	0.2425D 01	0.2451D 01
0.7D 01	0.2251D 01	0.2497D 01	0.2527D 01
0.8D 01	0.2285D 01	0.2559D 01	0.2593D 01
0.9D 01	0.2313D 01	0.2613D 01	0.2651D 01
0.1D 02	0.2337D 01	0.2661D 01	0.2703D 01
0.2D 02	0.2460D 01	0.2961D 01	0.3044D 01
0.3D 02	0.2522D 01	0.3121D 01	0.3242D 01
0.4D 02	0.2571D 01	0.3224D 01	0.3381D 01
0.5D 02	0.2615D 01	0.3297D 01	0.3488D 01
0.6D 02	0.2656D 01	0.3352D 01	0.3574D 01
0.7D 02	0.2695D 01	0.3395D 01	0.3646D 01
0.8D 02	0.2732D 01	0.3429D 01	0.3708D 01
0.9D 02	0.2768D 01	0.3457D 01	0.3762D 01
0.1D 03	0.2802D 01	0.3481D 01	0.3810D 01
0.2D 03	0.3073D 01	0.3605D 01	0.4111D 01
0.3D 03	0.3262D 01	0.3667D 01	0.4271D 01
0.4D 03	0.3402D 01	0.3717D 01	0.4374D 01
0.5D 03	0.3512D 01	0.3761D 01	0.4447D 01
0.6D 03	0.3603D 01	0.3803D 01	0.4502D 01
0.7D 03	0.3680D 01	0.3842D 01	0.4545D 01
0.8D 03	0.3747D 01	0.3880D 01	0.4579D 01
0.9D 03	0.3806D 01	0.3916D 01	0.4608D 01
0.1D 04	0.3859D 01	0.3950D 01	0.4631D 01
0.2D 04	0.4205D 01	0.4223D 01	0.4756D 01
0.3D 04	0.4408D 01	0.4412D 01	0.4818D 01
0.4D 04	0.4552D 01	0.4553D 01	0.4867D 01
0.5D 04	0.4663D 01	0.4663D 01	0.4912D 01
0.6D 04	0.4754D 01	0.4754D 01	0.4953D 01
0.7D 04	0.4831D 01	0.4831D 01	0.4993D 01
0.8D 04	0.4898D 01	0.4898D 01	0.5031D 01
0.9D 04	0.4957D 01	0.4957D 01	0.5067D 01

$\omega = 0.01$

$t_D/r_D^{\ 2}$	$\theta = 10$	$\theta = 1$	$\theta = 0.1$
0.1D-02	0.5705D-02	0.1151D-01	0.1236D-01
0.2D-02	0.19393)-01	0.6361D-01	0.7218D-01
0.3D-02	0.25971)-01	0.1206D 00	0.1434D 00
0.4D-02	0.2862D-01	0.1699D 00	0.2109D 00
0.5D-02	0.2985D-01	0.2106D 00	0.2719D 00
0.6D-02	0.3061D-01	0.2440D 00	0.32650 00
0.7D-02	0.3121D-01	0.2715D 00	0.3756D 00
0.8D-02	0.31771)-01	0.2942D 00	0.4200D 00
0.9D-02	0.3231D-01	0.3131D 00	0.4602D 00
0.1D-01	0.3284D-01	0.3289D 00	0.497133 00
0.2D-01	0.3821D-01	0.4014D 00	0.7476D 00
0.3D-01	0.4365D-01	0.4201D 00	0.89070 00
0.4D-01	0.4918D-01	0.4273D 00	0.9853D 00
0.5D-01	0.5477D-01	0.4315D 00	0.1053D 01
0.6D-01	0.60423)-01	0.4348D 00	0.1103D 01
0.7D-01	0.66141)-01	0.4379D 00	0.1142D 01
0.8D-01	0.7190D-01	0.4409D 00	0.117333 01
0.9D-01	0.77701)-01	0.4439D 00	0.1198D 01
0.1D 00	0.8354D-01	0.4468D 00	0.12180 01
0.2D 00	0.1431D 00	0.4757D 00	0.1305D 01
0.3D 00	0.2023D 00	0.5037D 00	0.13271) 01
0.4D 00	0.2592D 00	0.53090 00	0.1336D 01
0.5D 00	0.3130D 00	0.5572D 00	0.1342D 01
0.6D 00	0.3634D 00	0.5827D 00	0.1346D 01
0.7D 00	0.4103D 00	0.6074D 00	0.1351D 01
0.8D 00	0.4541D 00	0.6314D 00	0.1356D 01
0.9D 00	0.4950D 00	0.6546D 00	0.1360D 01
0.1D 01	0.5332D 00	0.6773D 00	0.1364D 01
0.2D 01	0.8147D 00	0.8717D 00	0.1407D 01
0.3D 01	0.99600 00	0.1022D 01	0.1448D 01
0.4D 01	0.1129D 01	0.1143D 01	0.1487D 01
0.5D 01	0.1234D 01	0.1242D 01	0.1525D 01
0.6D 01	0.1321D 01	0.1326D 01	0.1561D 01
0.7D 01	0.1395D 01	0.1399D 01	0.1595D 01
0.8D 01	0.1460D 01	0.1462D 01	0.1628D 01
0.9D 01	0.1517D 01	0.1519D 01	0.1660D 01
0.1D 02	0.1568D 01	0.1570D 01	0.1691D 01
0.2D 02	0.1909D 01	0.1909D 01	0.1940D 01
0.3D 02	0.2109D 01	0.2109D 01	0.2119D 01
0.4D 02	0.22521) 01	0.2252D 01	0.2256D 01
0.5D 02	0.2363D 01	0.23630 01	0.2365D 01
0.6D 02	0.2454D 01	0.2454D 01	0.2455D 01
0.7D 02	0.2531D 01	0.2531D 01	0.2531D 01
0.8D 02	0.2597D 01	0.2597D 01	0.2597D 01
0.9D 02	0.2656D 01	0.2656D 01	0.26561) 01
0.1D 03	0.2708D 01	0.2708D 01	0.2709D 01
0.2D 03	0.3054D 01	0.3054D 01	0.3054D 01
0.3D 03	0.3257D 01	0.3257D 01	0.3257D 01
0.4D 03	0.3401D 01	0.3401D 01	0.3401D 01
0.5D 03	0.3512D 01	0.3512D 01	0.3512D 01
0.6D 03	0.3603D 01	0.3603D 01	0.3603D 01
0.7D 03	0.3680D 01	0.3680D 01	0.3680D 01
0.8D 03	0.3747D 01	0.3747D 01	0.3747D 01
0.9D 03	0.3806D 01	0.3806D 01	0.38061) 01

$\omega = 0.01$

2	e = 0.01	e = 0.001	e = 0.0001
0. ID-02	0.1245D-01	0.1246D-01	0.1246D-01
0.2D-02	0.7310D-01	0.7320D-01	0.7321D-01
0.3D-02	0.1460D 00	0.1463D 00	0.1463D 00
0.4D-02	0.2156D 00	0.2161D 00	0.2161D 00
0.5D-02	0.2791D 00	0.27988 00	0.2799D 00
0.6D-02	0.3365D 00	0.33753) 00	0.3376D 00
0.7D-02	0.38853) 00	0.3899D 00	0.3900D 00
0.8D-02	0.4360D 00	0.4376D 00	0.4378D 00
0.9D-02	0.4795D 00	0.4815D 00	0.4816D 00
0.1D-01	0.5196D 00	.0.5219D 00	0.5221D 00
0.2D-01	0.8050D 00	0.8110D 00	0.8116D 00
0.3D-01	0.9834D 00	0.9935D 00	0.9945D 00
0.4D-01	0.1113D 01	0.1127D 01	0.1128D 01
0.5D-01	0.1214D 01	0.1232D 01	0.1234D 01
0.6D-01	0.1296D 01	0.1318D 01	0.1321D 01
0.7D-01	0.1365D 01	0.13928 01	0.13951) 01
0.8D-01	0.1425D 01	0.1456D 01	0.145933 01
0.9D-01	0.1478D 01	0.1513D 01	0.1517D 01
0.1D 00	0.1525D 01	0.1564D 01	0.1568D 01
0.2D 00	0.1819D 01	0.1899D 01	0.19080 01
0.3D 00	0.1976D 01	0.2095D 01	0.2108D 01
0.4D 00	0.2077D 01	0.2233D 01	0.22508 01
0.5D 00	0.2149D 01	0.2339D 01	0.23610 01
0.6D 00	0.2201D 01	0.2425D 01	0.2451D 01
0.7D 00	0.2242D 01	0.2497D 01	0.2527D 01
0.8D 00	0.2273D 01	0.2559D 01	0.2593D 01
0.9D 00	0.2299D 01	0.2613D 01	0.2651D 01
0.1D 01	0.2319D 01	0.2660D 01	0.2703D 01
0.2D 01	0.2408D 01	0.2960D 01	0.3044D 01
0.3D 01	0.2431D 01	0.3119D 01	0.3242D 01
0.4D 01	0.2440D 01	0.3220D 01	0.33811) 01
0.5D 01	0.2446D 01	0.32923) 01	0.3488D 01
0.6D 01	0.2451D 01	0.3345D 01	0.3574D 01
0.7D 01	0.2456D 01	0.3385D 01	0.36461) 01
0.8D 01	0.2461D 01	0.3417D 01	0.37080 01
0.9D 01	0.2466D 01	0.3442D 01	0.3762D 01
0.1D 02	0.2471D 01	0.3463D 01	0.3810D 01
0.2D 02	0.2517D 01	0.3552D 01	0.4110D 01
0.3D 02	0.2561D 01	0.3575D 01	0.4269D 01
0.4D 02	0.2603D 01	0.3584D 01	0.43701) 01
0.5D 02	0.2643D 01	0.3590D 01	0.4442D 01
0.6D 02	0.2681D 01	0.3596D 01	0.4495D 01
0.7D 02	0.2718D 01	0.3601D 01	0.4535D 01
0.8D 02	0.2753D 01	0.3605D 01	0.4567D 01
0.9D 02	0.278713 01	0.3610D 01	0.4593D 01
0.1D 03	0.2819D 01	0.3615D 01	0.4613D 01
0.2D 03	0.3079D 01	0.3662D 01	0.4702D 01
0.3D 03	0.3264D 01	0.3706D 01	0.4725D 01
0.4D 03	0.3403D 01	0.3749D 01	0.4734D 01
0.5D 03	0.3513D 01	0.3789D 01	0.4741D 01
0.6D 03	0.3603D 01	0.3828D 01	0.4746D 01
0.7D 03	0.3680D 01	0.3865D 01	0.4751D 01
0.8D 03	0.3747D 01	0.3900D 01	0.47563) 01
0.9D 03	0.3806D 01	0.3934D 01	0.4761D 01

$\omega = 0.001$

t_D/r_D^2	$\theta = 10$	$\theta = 1$	$\theta = 0.1$
0.1D-03	0.5697D-02	0.1151D-01	0.1236D-01
0.2D-03	0.1925D-01	0.6 360D-01	0.7218D-01
0.3D-03	0.2554D-01	0.1205D 00	0.14340 00
0.4D-03	0.2779D-01	0.1698D 00	0.2109D 00
0.5D-03	0.2859D-01	0.2105D 00	0.2719D 00
0.6D-03	0.2888D-01	0.2439D 00	0.32650 00
0.7D-03	0.2901D-01	0.27138 00	0.3756D 00
0.8D-03	0.2909D-01	0.2939D 00	0.4200D 00
0.9D-03	0.2916D-01	0.3127D 00	0.4602D 00
0.1D-02	0.29210-01	0.3284D 00	0.4971D 00
0.2D-02	0.2974D-01	0.3991D 00	0.74760 00
0.3D-02	0.3027D-01	0.4155D 00	0.8905D 00
0.4D-02	0.3079D-01	0.4200D 00	0.9851D 00
0.5D-02	0.3132D-01	0.4216D 00	0.1053D 01
0.6D-02	0.3185D-01	0.4223D 00	0.1103D 01
0.7D-02	0.3238D-01	0.4227D 00	0.1142D 01
0.8D-02	0.3291D-01	0.4230D 00	0.1172D 01
0.9D-02	0.3344D-01	0.4233D 00	0.1197D 01
0.1D-01	0.3397D-01	0.4236D 00	0.1217D 01
0.2D-01	0.3934D-01	0.4266D 00	0.1301D 01
0.3D-01	0.4479D-01	0.4296D 00	0.1319D 01
0.4D-01	0.5032D-01	0.4326D 00	0.1324D 01
0.5D-01	0.5591D-01	0.4356D 00	0.1326D 01
0.6D-01	0.6 157D-01	0.4385D 00	0.1326D 01
0.7D-01	0.6727D-01	0.4415D 00	0.1327D 01
0.8D-01	0.7303D-01	0.4444D 00	0.1327D 01
0.9D-01	0.7883D-01	0.44733) 00	0.1328D 01
0.1D 00	0.8466D-01	0.4503D 00	0.1328D 01
0.2D 00	0.1441D 00	0.4790D 00	0.13330 01
0.3D 00	0.2031D 00	0.5068D 00	0.1337D 01
0.4D 00	0.2599D 00	0.53370 00	0.1342D 01
0.5D 00	0.3135D 00	0.5598D 00	0.1346D 01
0.6D 00	0.3638D 00	0.5851D 00	0.1351D 01
0.7D 00	0.4107D 00	0.6097D 00	0.1355D 01
0.8D 00	0.4544D 00	0.6336D 00	0.1360D 01
0.9D 00	0.4953D 00	0.6567D 00	0.1364D 01
0.1D 01	0.5334D 00	0.6792D 00	0.1368D 01
0.2D 01	0.8147D 00	0.87278 00	0.1411D 01
0.3D 01	0.9960D 00	0.1023D 01	0.1452D 01
0.4D 01	0.1129D 01	0.1143D 01	0.1490D 01
0.5D 01	0.1234D 01	0.1243D 01	0.1528D 01
0.6D 01	0.1321D 01	0.13260 01	0.1563D 01
0.7D 01	0.1395D 01	0.1399D 01	0.1598D 01
0.8D 01	0.1460D 01	0.1462D 01	0.1630D 01
0.9D 01	0.1517D 01	0.1519D 01	0.16620 01
0.1D 02	0.1568D 01	0.1570D 01	0.1692D 01
0.2D 02	0.1909D 01	0.1909D 01	0.1941D 01
0.3D 02	0.2109D 01	0.2109D 01	0.2120D 01
0.4D 02	0.2252D 01	0.2252D 01	0.2256D 01
0.5D 02	0.2363D 01	0.2363D 01	0.2365D 01
0.6D 02	0.2454D 01	0.2454D 01	0.2455D 01
0.7D 02	0.2531D 01	0.25310 01	0.2531D 01
0.8D 02	0.2597D 01	0.2597D 01	0.2597D 01
0.9D 02	0.2656D 01	0.2656D 01	0.2656D 01

w = **0.001**

t_D/r_D^2	e = 0.01	e = 0.001	e = 0.0001
0.1D-03	0.1245D-01	0.1246D-01	0.1246D-01
0.2D-03	0.7310D-01	0.7320D-01	0.7321D-01
0.3D-03	0.1460D 00	0.1463D 00	0.1463D 00
0.4D-03	0.2156D 00	0.2161D 00	0.2161D 00
0.5D-03	0.2791D 00	0.2798D 00	0.2799D 00
0.6D-03	0.3365D 00	0.3375D 00	0.3376D 00
0.7D-03	0.3885D 00	0.3899D 00	0.3900D 00
0.8D-03	0.4360D 00	0.4376D 00	0.4378D 00
0.9D-03	0.4795D 00	0.4815D 00	0.4816D 00
0.1D-02	0.5196D 00	0.5219D 00	0.52210 00
0.2D-02	0.8050D 00	0.8110D 00	0.8116D 00
0.3D-02	0.9834D 00	0.9935D 00	0.9945D 00
0.4D-02	0.11130 01	0.1127D 01	0.1128D 01
0.5D-02	0.1214D 01	0.1232D 01	0.1234D 01
0.6D-02	0.1296D 01	0.1318D 01	0.1321D 01
0.7D-02	0.1365D 01	0.1392D 01	0.1395D 01
0.8D-02	0.1425D 01	0.1456D 01	0.1459D 01
0.9D-02	0.1478D 01	0.1513D 01	0.1517D 01
0.1D-01	0.1525D 01	0.1564D 01	0.1568D 01
0.2D-01	0.1819D 01	0.1899D 01	0.1908D 01
0.3D-01	0.1976D 01	0.2095D 01	0.2108D 01
0.4D-01	0.2077D 01	0.2233D 01	0.2250D 01
0.5D-01	0.2148D 01	0.2339D 01	0.2361D 01
0.6D-01	0.2201D 01	0.2425D 01	0.2451D 01
0.7D-01	0.2241D 01	0.2497D 01	0.2527D 01
0.8D-01	0.2272D 01	0.2559D 01	0.2593D 01
0.9D-01	0.2297D 01	0.2613D al	0.2651D 01
0.1D 00	0.2318D 01	0.2660D 01	0.2703D 01
0.2D 00	0.2403D 01	0.2960D 01	0.3044D 01
0.3D 00	0.2422D 01	0.3118D 01	0.3242D 01
0.4D 00	0.2427D 01	0.3220D 01	0.3381D 01
0.5D 00	0.2428D 01	0.3291D 01	0.3488D 01
0.6D 00	0.2429D 01	0.33441) 01	0.3574D 01
0.7D 00	0.2430D 01	0.3384D 01	0.3646D 01
0.8D 00	0.2430D 01	0.3416D 01	0.3708D 01
0.9D 00	0.24310 01	0.3441D 01	0.3762D 01
0.1D 01	0.2431D 01	0.3461D 01	0.3810D 01
0.2D 01	0.2436D 01	0.3547D 01	0.4110D 01
0.3D 01	0.2441D 01	0.3565D 01	0.4268D 01
0.4D 01	0.2446D 01	0.3571D 01	0.4370D 01
0.5D 01	0.2451D 01	0.3572D 01	0.4441D 01
0.6D 01	0.2456D 01	0.3573D 01	0.4494D 01
0.7D 01	0.2461D 01	0.3574D 01	0.4534D 01
0.8D 01	0.2465D 01	0.3574D 01	0.4566D 01
0.9D 01	0.2470D 01	0.35750 01	0.4591D 01
0.1D 02	0.2475D 01	0.3575D 01	0.4612D 01
0.2D 02	0.2521D 01	0.3580D 01	0.4697D 01
0.3D 02	0.2564D 01	0.3585D 01	0.4716D 01
0.4D 02	0.2606D 01	0.3590D 01	0.4721D 01
0.5D 02	0.2646D 01	0.3595D 01	0.4723D 01
0.6D 02	0.2684D 01	0.3600D 01	0.4724D 01
0.7D 02	0.2720D 01	0.36050 01	0.4724D 01
0.8D 02	0.2755D 01	0.3610D 01	0.4725D 01
0.9D 02	0.2788D 01	0.3614D 01	0.4725D 01

P_{mD} VS t_D/r_D^2 ($\lambda = 10^{-5}$)

t_D/r_D^2	ω = 0.1	ω = 0.01	ω = 0.001
0.1D-01	0.1439D-03	0.2440D-02	0.2997D-02
0.2D-01	0.1581D-02	0.5622D-02	0.6216D-02
0.3D-01	0.4168D-02	0.9018D-02	0.9643D-02
0.4D-01	0.7329D-02	0.1262D-01	0.1327D-01
0.5D-01	0.1082D-01	0.1640D-01	0.1707D-01
0.6D-01	0.1456D-01	0.2036D-01	0.2106D-01
0.7D-01	0.1852D-01	0.2449D-01	0.2520D-01
0.8D-01	0.2266D-01	0.2877D-01	0.2949D-01
0.9D-01	0.2698D-01	0.3320D-01	0.3393D-01
0.1D 00	0.3147D-01	0.3776D-01	0.3849D-01
0.2D 00	0.8296D-01	0.8886D-01	0.8955D-01
0.3D 00	0.1408D 00	0.1453D 00	0.1459D 00
0.4D 00	0.1998D 00	0.2028D 00	0.2031D 00
0.5D 00	0.2572D 00	0.2588D 00	0.2590D 00
0.6D 00	0.3115D 00	0.3121D 00	0.3122D 00
0.7D 00	0.3625D 00	0.3623D 00	0.3623D 00
0.8D 00	0.4100D 00	0.4092D 00	0.4092D 00
0.9D 00	0.4542D 00	0.4531D 00	0.4530D 00
0.1D 01	0.4954D 00	0.4940D 00	0.4939D 00
0.2D 01	0.7937D 00	0.7921D 00	0.7920D 00
0.3D 01	0.9816D 00	0.9804D 00	0.9803D 00
0.4D 01	0.1118D 01	0.1117D 01	0.1117D 01
0.5D 01	0.1226D 01	0.1225D 01	0.1225D 01
0.6D 01	0.1314D 01	0.1313D 01	0.1313D 01
0.7D 01	0.1389D 01	0.1389D 01	0.1388D 01
0.8D 01	0.1454D 01	0.1454D 01	0.1454D 01
0.9D 01	0.1512D 01	0.1512D 01	0.1512D 01
0.1D 02	0.1564D 01	0.1564D 01	0.1563D 01
0.2D 02	0.1906D 01	0.19060 01	0.1906D 01
0.3D 02	0.2108D 01	0.2108D 01	0.2108D 01
0.4D 02	0.2251D 01	0.2251D 01	0.2251D 01
0.5D 02	0.2362D 01	0.23628 01	0.2362D 01
0.6D 02	0.2453D 01	0.2453D 01	0.2453D 01
0.7D 02	0.25300 01	0.25300 01	0.2530D 01
0.8D 02	0.2597D 01	0.2596D 01	0.2596D 01
0.9D 02	0.2655D 01	0.2655D 01	0.2655D 01
0.1D 03	0.2708D 01	0.2708D 01	0.2708D 01
0.2D 03	0.3054D 01	0.3054D 01	0.3054D 01
0.3D 03	0.3257D 01	0.3257D 01	0.3257D 01
0.4D 03	0.3400D 01	0.3400D 01	0.3400D 01
0.5D 03	0.3512D 01	0.3512D 01	0.3512D 01
0.6D 03	0.3603D 01	0.3603D 01	0.3603D 01
0.7D 03	0.3680D 01	0.3680D 01	0.3680D 01
0.8D 03	0.3747D 01	0.3747D 01	0.3747D 01
0.9D 03	0.3806D 01	0.3806D 01	0.3806D 01
0.1D 04	0.3858D 01	0.3858D 01	0.3858D 01
0.2D 04	0.4205D 01	0.4205D 01	0.4205D 01
0.3D 04	0.4408D 01	0.4408D 01	0.4408D 01
0.4D 04	0.4552D 01	0.4552D 01	0.4552D 01
0.5D 04	0.4663D 01	0.4663D 01	0.4663D 01
0.6D 04	0.4754D 01	0.4754D 01	0.4754D 01
0.7D 04	0.48311) 01	0.4831D 01	0.4831D 01
0.8D 04	0.4898D 01	0.4898D 01	0.4898D 01
0.9D 04	0.4957D 01	0.4957D 01	0.4957D 01

$A = 10^{-6}$

t_D/r_w^2	ω = 0.1	w = 0.01	w = 0
0.1D-01	0.2651D-04	0.1875D-02	0.4204D-02
0.2D-01	0.4232D-03	0.56 15D-02	0.8397D-02
0.3D-01	0.1443D-02	0.9705D-02	0.1258D-01
0.4D-01	0.3044D-02	0.1387D-01	0.1675D-01
0.5D-01	0.5128D-02	0.1805D-01	0.2090D-01
0.6D-01	0.7604D-02	0.2222D-01	0.2505D-01
0.7D-01	0.1040D-01	0.2638D-01	0.2918D-01
0.8D-01	0.1344D-01	0.3053D-01	0.3330D-01
0.9D-01	0.1670D-01	0.3467D-01	0.3741D-01
0.1D 00	0.20 12D-01	0.3880D-01	0.4151D-01
0.2D 00	0.5897D-01	0.7942D-01	0.8183D-01
0.3D 00	0.1000D 00	0.1189D 00	0.1210D 00
0.4D 00	0.1405D 00	0.1572D 00	0.15913, 00
0.5D 00	0.1800D 00	0.1944D 00	0.1960D 00
0.6D 00	0.2182D 00	0.2305D 00	0.23193) 00
0.7D 00	0.2553D 00	0.2655D 00	0.2667D 00
0.8D 00	0.2912D 00	0.2996D 00	0.3005D 00
0.9D 00	0.3260D 00	0.3326D 00	0.3334D 00
0.1D 01	0.3596D 00	0.3646D 00	0.3653D 00
0.2D 01	0.6436D 00	0.6382D 00	0.6377D 00
0.3D 01	0.8535D 00	0.8443D 00	0.8434D 00
0.4D 01	0.1013D 01	0.1003D 01	0.1002D 01
0.5D 01	0.1139D 01	0.1130D 01	0.1129D 01
0.6D 01	0.1241D 01	0.1233D 01	0.1232D 01
0.7D 01	0.13270 01	0.1320D 01	0.1319D 01
0.8D 01	0.1400D 01	0.1394D 01	0.1393D 01
0.9D 01	0.1464D 01	0.1459D 01	0.1458D 01
0.1D 02	0.1521D 01	0.1516D 01	0.1516D 01
0.2D 02	0.1886D 01	0.1883D 01	0.1883D 01
0.3D 02	0.2094D 01	0.2093D 01	0.2092D 01
0.4D 02	0.2241D 01	0.2240D 01	0.2239D 01
0.5D 02	0.2354D 01	0.2353D 01	0.2353D 01
0.6D 02	0.2446D 01	0.2445D 01	0.2445D 01
0.7D 02	0.25241) 01	0.2523D 01	0.2523D 01
0.8D 02	0.2591D 01	0.2591D 01	0.2591D 01
0.9D 02	0.2651D 01	0.2650D 01	0.26500 01
0.1D 03	0.2704D 01	0.2703D 01	0.2703D 01
0.2D 03	0.3052D 01	0.3052D 01	0.3052D 01
0.3D 03	0.3255D 01	0.3255D 01	0.3255D 01
0.4D 03	0.3399D 01	0.3399D 01	0.3399D 01
0.5D 03	0.3511D 01	0.3511D 01	0.3511D 01
0.6D 03	0.3602D 01	0.3602D 01	0.36020 01
0.7D 03	0.3680D 01	0.3680D 01	0.3680D 01
0.8D 03	0.3746D 01	0.3746D 01	0.3746D 01
0.9D 03	0.3805D 01	0.3805D 01	0.3805D 01
0.1D 04	0.3858D 01	0.3858D 01	0.3858D 01
0.2D 04	0.4205D 01	0.4205D 01	0.4205D 01
0.3D 04	0.4408D 01	0.4408D 01	0.4408D 01
0.4D 04	0.4551D 01	0.4551D 01	0.45510 01
0.5D 04	0.4663D 01	0.4663D 01	0.4663D 01
0.6D 04	0.4754D 01	0.4754D 01	0.4754D 01
0.7D 04	0.4831D 01	0.4831D 01	0.4831D 01
0.8D 04	0.4898D 01	0.4898D 01	0.4898D 01
0.9D 04	0.4957D 01	0.4957D 01	0.4957D 01

$\lambda = 10^{-7}$

t_D/r_D^2	ω = .0.1	ω = 0.01	ω = 0
0.1D-01	0.2823D-05	a.2563D-03	0.1324D-02
0.2D-01	0.4713D-04	0.8984D-03	0.2647D-02
0.3D-01	0.1668D-03	0.1730D-02	0.3969D-02
0.4D-01	0.3640D-03	0.2678D-02	0.5290D-02
0.5D-01	0.6322D-03	0.37 06D-02	0.6611D-02
0.6D-01	0.9644D-03	0.4792D-02	0.7930D-02
0.7D-01	0.1354D-02	0.5922D-02	0.9249D-02
0.8D-01	0.1794D-02	0.7085D-02	0.1057D-01
0.9D-01	0.2282D-02	0.82750-02	0.1188D-01
0.1D 00	0.2811D-02	0.9487D-02	0.1320D-01
0.2D 00	0.9815D-02	0.2218D-01	0.2631D-01
0.3D 00	0.18830-01	0.3521D-01	0.3934D-01
0.4D 00	0.2904D-01	0.4824D-01	0.5229D-01
0.5D 00	0.4003D-01	0.6121D-01	0.6514D-01
0.6D 00	0.5157D-01	0.7410D-01	0.7792D-01
0.7D 00	0.6349D-01	0.8691D-01	0.9061D-01
0.8D 00	0.7568D-01	0.9964D-01	0.1032D 00
0.9D 00	0.8807D-01	0.1123D 00	0.1157D 00
0.1D 01	0.1006D 00	0.1248D 00	0.1282D 00
0.2D 01	0.2271D 00	0.2460D 00	0.2483D 00
0.3D 01	0.3486D 00	0.3596D 00	0.3610D 00
0.4D 01	0.4626D 00	0.4661D 00	0.4667D 00
0.5D 01	0.5692D 00	0.56611) 00	0.5660D 00
0.6D 01	0.6688D 00	0.66000 00	0.6592D 00
0.7D 01	0.7618D 00	0.7482D 00	0.7470D 00
0.8D 01	0.8489D 00	0.83121) 00	0.82951) 00,
0.9D 01	0.9304D 00	0.9094D 00	0.9073D 00
0.1D 02	0.1007D 01	0.9830D 00	0.9806D 00
0.2D 02	0.1562D 01	0.1530D 01	0.1526D 01
0.3D 02	0.1887D 01	0.1860D 01	0.1857D 01
0.4D 02	0.20980 01	0.2077D 01	0.2075D 01
0.5D 02	0.2248D 01	0.2232D 01	0.2230D 01
0.6D 02	0.2362D 01	0.2351D 01	0.2349D 01
0.7D 02	0.2455D 01	0.2446D 01	0.2445D 01
0.8D 02	0.2533D 01	0.25250 01	0.2524D 01
0.9D 02	0.2600D 01	0.25931) 01	0.2592D 01
0.1D 03	0.2659D 01	0.2653D 01	0.2652D 01
0.2D 03	0.3031D 01	0.3028D 01	0.3028D 01
0.3D 03	0.3241D 01	0.3240D 01	0.3240D 01
0.4D 03	0.33890 01	0.33881) 01	0.3388D 01
0.5D 03	0.3503D 01	0.3502D 01	0.3502D 01
0.6D 03	0.3596D 01	0.35951) 01	0.3595D 01
0.7D 03	0.36740 01	0.3673D 01	0.3673D 01
0.8D 03	0.3741D 01	0.37410 01	0.37410 01
0.9D 03	0.3801D 01	0.3800D 01	0.3800D 01
0.1D 04	0.3854D 01	0.3854D 01	0.3853D 01
0.2D 04	0.4203D 01	0.4203D 01	0.4203D 01
0.3D 04	0.4406D 01	0.4406D 01	0.4406D 01
0.4D 04	0.4550D 01	0.4550D 01	0.4550D 01
0.5D 04	0.4662D 01	0.4662D 01	0.4662D 01
0.6D 04	0.4754D 01	0.4753D 01	0.4753D 01
0.7D 04	0.4831D 01	0.4831D 01	0.4831D 01
0.8D 04	0.48983) 01	0.4898D 01	0.4898D 01
0.90 04	0.4957D 01	0.4956D 01	0.49561) 01

$\lambda = 10^{-9}$

t_D/r_D^2	ω = 0.1	ω = 0.01	W = 0
0.1D 01	0.1241D-02	0.2214D-02	0.3569D-02
0.2D 01	0.3184D-02	0.5068D-02	0.7136D-02
0.3D 01	0.5406D-02	0.81381)-02	0.1070D-01
0.4D 01	0.7807D-02	0.1133D-01	0.1426D-01
0.5D 01	0.1034D-01	0.1461D-01	0.17821)-01
0.6D 01	0.1297D-01	0.1795D-01	0.2137D-01
0.7D 01	0.1569D-01	0.2133D-01	0.2492D-01
0.8D 01	0.1848D-01	0.2474D-01	0.2847D-01
0.9D 01	0.21341)-01	0.2818D-01	0.3201D-01
0.1D 02	0.2424D-01	0.3164D-01	0.3556D-01
0.2D 02	0.5525D-01	0.6669D-01	0.7 081D-01
0.3D 02	0.8831D-01	0.1018D 00	0.1058D 00
0.4D 02	0.1224D 00	0.1368D 00	0.1404D 00
0.5D 02	0.1571D 00	0.1715D 00	0.1748D 00
0.6D 02	0.1921D 00	0.2059D 00	0.2088D 00
0.7D 02	0.2273D 00	0.2400D 00	0.2426D 00
0.8D 02	0.2625D 00	0.2738D 00	0.2761D 00
0.9D 02	0.2976D 00	0.3073D 00	0.3093D 00
0.1D 03	0.3327D 00	0.3405D 00	0.3422D 00
0.2D 03	0.6715D 00	0.6574D 00	0.6563D 00
0.3D 03	0.9836D 00	0.9483D 00	0.9449D 00
0.4D 03	0.1269D 01	0.1215D 01	0.1210D 01
0.5D 03	0.1528D 01	0.1461D 01	0.1454D 01
0.6D 03	0.1765D 01	0.1686D 01	0.1678D 01
0.7D 03	0.1982D 01	0.1894D 01	0.1885D 01
0.8D 03	0.2179D 01	0.2085D 01	0.2075D 01
0.9D 03	0.2360D 01	0.2261D 01	0.2251D 01
0.1D 04	0.2526D 01	0.2424D 01	0.2413D 01
0.2D 04	0.3595D 01	0.3507D 01	0.3497D 0f'
0.3D 04	0.4095D 01	0.4038D 01	0.4031D 01
0.4D 04	0.4365D 01	0.4330D 01	0.4326D 01
0.5D 04	0.4536D 01	0.4514D 01	0.4512D 01
0.6D 04	0.4659D 01	0.4644D 01	0.46429 01
0.7D 04	0.4754D 01	0.4743D 01	0.4742D 01
0.8D 04	0.4833D 01	0.4825D 01	0.4824D 01
0.9D 04	0.4900D 01	0.4893D 01	0.4893D 01
0.1D 05	0.4960D 01	0.4954D 01	0.4953D 01
0.2D 05	0.5333D 01	0.5330D 01	0.5330D 01
0.3D 05	0.5544D 01	0.5542D 01	0.5542D 01
0.4D 05	0.5691D 01	0.5690D 01	0.5690D 01
0.5D 05	0.5805D 01	0.5804D 01	0.5804D 01
0.6D 05	0.5898D 01	0.5897D 01	0.5897D 01
0.7D 05	0.5976D 01	0.5975D 01	0.5975D 01
0.8D 05	0.6044D 01	0.6043D 01	0.6043D 01
0.9D 05	0.6103D 01	0.6103D 01	0.6103D 01
0.1D 06	0.6156D 01	0.6156D 01	0.6156D 01
0.2D 06	0.6505D 01	0.65051) 01	0.65050 01
0.3D 06	0.6709D 01	0.6709D 01	0.6709D 01
0.4D 06	0.6853D 01	0.6853D 01	0.6853D 01
0.5D 06	0.6965D 01	0.6965D 01	0.6965D 01
0.6D 06	0.7056D 01	0.7056D 01	0.7056D 01
0.7D 06	0.7133D 01	0.7133D 01	0.7133D 01
0.8D 06	0.7200D 01	0.7200D 01	0.7200D 01
0.9D 06	0.7259D 01	0.7259D 01	0.7259D 01

$\lambda = 10^{-10}$

t_D/r_D^2	ω = 0.1	ω = 0.01	W = 0
0.1D 02	0.2459D-02	0.3367D-02	0.4719D-02
0.2D 02	0.5670D-02	0.7382D-02	0.9434D-02
0.3D 02	0.9161D-02	0.1161D-01	0.1414D-01
0.4D 02	0.1283D-01	0.1596D-01	0.1885D-01
0.5D 02	0.1663D-01	0.2040D-01	0.2355D-01
0.6D 02	0.2054D-01	0.2489D-01	0.2825D-01
0.7D 02	0.2453D-01	0.2942D-01	0.3295D-01
0.8D 02	0.2858D-01	0.3399D-01	0.3764D-01
0.9D 02	0.327 0D-01	0.3858D-01	0.4232D-01
0.1D 03	0.3687D-01	0.4319D-01	0.4700D-01
0.2D 03	0.8044D-01	0.8968D-01	0.9359D-01
0.3D 03	0.1259D 00	0.1362D 00	0.1398D 00
0.4D 03	0.1723D 00	0.1823D 00	0.1855D 00
0.5D 03	0.2192D 00	0.2281D 00	0.2309D 00
0.6D 03	0.2662D 00	0.2735D 00	0.2758D 00
0.7D 03	0.3133D 00	0.3185D 00	0.32040 00
0.8D 03	0.3602D 00	0.3631D 00	0.36450 00
0.9D 03	0.4070D 00	0.4072D 00	0.4083D 00
0.1D 04	0.4536D 00	0.4510D 00	0.4517D 00
0.2D 04	0.9007D 00	0.86780 00	0,86493) 00
0.3D 04	0.1310D 01	0.1249D 01	0.1243D 01
0.4D 04	0.1681D 01	0.1598D 01	0.1589D 01
0.5D 04	0.2019D 01	0.1917D 01	0.1907D 01
0.6D 04	0.2325D 01	0.2209D 01	0.2197D 01
0.7D 04	0.2604D 01	0.2477D 01	0.2464D 01
0.8D 04	0.2857D 01	0.2723D 01	0.2709D 01
0.9D 04	0.3088D 01	0.2948D 01	0.2934D 01
0.1D 05	0.3298D 01	0.3155D 01	0.3140D 01
0.2D 05	0.4622D 01	0.45050 01	0.4493D 01
0.3D 05	0.5205D 01	0.5133D 01	0.5125D 01
0.4D 05	0.5503D 01	0.5461D 01	0.545713 01
0.5D 05	0.5683D 01	0.5658D 01	0.5655D 01
0.6D 05	0.5808D 01	0.57928 01	0.5790D 01
0.7D 05	0.5905D 01	0.5894D 01	0.58920 01
0.8D 05	0.5984D 01	0.5975D 01	0.5974D 01
0.9D 05	0.6052D 01	0.6045D 01	0.6044D 01
0.1D 06	0.6111D 01	0.6105D 01	0.61040 01
0.2D 06	0.6484D 01	0.6481D 01	0.6481D 01
0.3D 06	0.6695D 01	0.66930 01	0.66933) 01
0.4D 06	0.6843D 01	0.6841D 01	0.6841D 01
0.5D 06	0.6957D 01	0.69563) 01	0.6956D 01
0.6D 06	0.7049D 01	0.70483) 01	0.7048D 01
0.7D 06	0.7127D 01	0.7127D 01	0.71278 01
0.8D 06	0.7195D 01	0.7194D 01	0.7194D 01
0.9D 06	0.7255D 01	0.725433 01	0.7254D 01
0.1D 07	0.7308D 01	0.7307D 01	0.7307D 01
0.2D 07	0.7657D 01	0.7656D 01	0.7656D 01
0.3D 07	0.7860D 01	0.7860D 01	0.7860D 01
0.4D 07	0.8004D 01	0.8004D 01	0.8004D 01
0.5D 07	0.8116D 01	0.8116D 01	0.81163) 01
0.6D 07	0.8207D 01	0.8207D 01	0.8207D 01
0.7D 07	0.8285D 01	0.8285D 01	0.8285D 01
0.8D 07	0.8351D 01	0.8351D 01	0.8351D 01
0.9D 07	0.8410D 01	0.8410D 01	0.84103) 01

APPENDIX D

COMPUTER PROGRAMS

This section contains the computer program documentation and the computer program.

D.1 PROGRAM DOCUMENTATION

This program solves the two-porosity system. The program makes use of three functions: PWD, PWDLS, and the FUNPACK.

The function PWD is the program for numerical inversion. This function computes either the dimensionless pressure or the flowrate as a function of dimensionless time by computing the Laplace transform inverse of PWDL(S) by Stehfest (1970) numerical approximation. The input for PWD is the function whose inverse transform is desired. This is contained in the function PWDL(S), the values of the dimensionless time t_D, and the number of terms to be used in the approximation. The output is the value of the dimensionless pressure or the flowrate.

The function PWDL(S) provides the expressions for either the dimensionless pressure or the flowrate in Laplace space. The function PWDL(S) makes use of the functions BESKI(X), BESKO(X), BESI1(X), and BESIO(X) to evaluate the Modified Bessel functions. These functions are included in the FUNPACK IBM S/370 provided by Stanford University. The packet is designed to give near-optimal accuracy on an IBM S/360 or S/370 computer. The relative error in these functions is on the order of 10^{-15}.

D.2 COMPUTER PROGRAM

```
C
C
C
C
C                IN A CLOSED SYSTEM(FINITE,CONSTANT
C                INNER PRESSURE)
C       CASE=1:COMPUTE THE DIMENSIONLESS FLOW RATE IN
C                A CLOSED SYSTEM,CONSTANT INNER PRESURE
C                (ANALYTICAL SOLUTION).
C       CASE=2:CONPUTE DIMENSIONLESS FLOW RATE IN
C                A INFINITE SYSTEM(CONSTANT INNER PRESSURE)
C       CASE=3:CONPUTE THE DIMENSIONLESS WELLBORE
C
C
C       CASE=4:CONPUTE THE DIMENSIONLESS WELLBORE
C                PRESSURE IN FINITE SYSTEM(CLOSED,CONS-
C                TANT FLOW RATE)
C       CASE=5:CONPUTE THE DIMENSIONLESS PRESSURE
C                BUILD-UP IN A INFINITE SYSTEM.
C
C
C
C
C
C
C
C
C
C       CASE=9 :INTERFERENCE ANALYSIS.  INFINITE
C                SYSTEM. CONSTANT FLOW RATE. MATRIX
C                DIMENSIONLESS PRESSURE SOLUTIOK.
C
C       CASE=10:PSEUDO STEADY STATE(FLOW RATE-
C                CLOSED SYSTEM).
C
C
C
C
C
C                CONSTANT INNER PRESSURE. MATRIX SOLUTION.
C       CASE=13:PRESSURE BUILD-UP IN A CLOSED SYSTEM
C                ANALYTICAL ANALYSIS. WARREN ANI! RCOT
C                SOLUTION FOR A CLOSED TWO POROSITY SYSTEM.
C       CASE=14: PRESSURE BUILD-UP IN A CLOSED (MUSKAT TYPE)
C
C       CASE=1
C       CASE=1
C
C
C
C       CASE=18:
C
C
```

```
C         EXECUTABLE PROGRAM
C
          IMPLICIT REAL*8(A-H,O-Z)
          REAL*8 LAN,IO,I1,KO,K1,IOX,KOX,NUM,DEXP
          REAL*8 RED,RD,K1X,I1X,K1Y,I1Y,IOZ,KOZ
          COMMON/FRAC/W,LAN,CD,SKIN,RED,RD,CASE,TD
C
C         RESERVOIR PARAMETERS.
C
          DATA W/0.010D0/,LAN/1.D-09/,SKIN/0.D0/
          DATA RED/ 10.D0/    ,RD/1.D0/    ,CD/1000.D0/,TPD/1.D03/
C
C
          CASE=0
          IF(CASE.EQ.5.OR.CASE.EQ.6)GO TO 550
          IF(CASE.EQ.7)GO TO 560
          IF(CASE.EQ.8.OR.CASE.EQ.9)GO TO 570
          IF(CASE.EQ.11.OR.CASE.EQ.12)GO TO 570
          IF(CASE.EQ.13)GO TO 580
          IF(CASE.EQ.14)GO TO 590
          IF(CASE.EQ.15)GO TO 601
          IF(CASE.EQ.18)GO TO 602
C         WRITE(21,444)
c444      FORMAT('**  CLOSED RESERVOIR - CONSTANT INNER PRESSURE: **')
C         WRITE(21,443)RED,W,LAN,SKIN
C443      FORMAT(' ','RED=',D20.9,X,'W=',D20.9,2X,'LAMBDA=',
C     1   D20.9,X,'SKIN=',D20.9)
C         WRITE(21,445)
C445      FORMAT(' ',T11,'TD',T37,'QD')
C
C
C         CALCULATION OF EITHER
C         DIMENSIONLESS FLOW RATE
C         OR DIMENSIONLESS WELLBORE PRESSURE
C
          DELTD=0.01D0
          DO 500 K=1,13
          TD=0.D0
          DO 200 J=1,9
          TD=TD+DELTD
          IF(CASE.EQ.16)GO TO 5482
          IF(CASE.EQ.17)GO TO 5483
          IF(CASE.EQ.10)GO TO 5432
          IF(CASE.EQ.1)GO TO 111
          PDWELL=PWD(TD)
          GO TO 1111
  111     X=(RED**2-1.D0)*LAN*(1.D0+W)
          Y=2.D0*(1.D0+W)
          Z=LAN/(1.D0-W)
          PDWELL=(X/Y)*DEXP(-Z*TD)
          GO TO 1111
 5432     X=1.D0/(DLOG(RED)-0.75D0)
          Y=2.D0/(W*(RED**2)*(DLOG(RED)-0.75D0))
          PDWELL=X*DEXP(-Y*TD)
          GO TO 1111
 5482     X=(2.D0*TD)/(W*(RED**2))
          Y=DLOG(RED)
          PDWELL=X+Y-0.75D0
          GO TO 1111
 5483     X=2.D0*TD/(RED**2)
```

```
      Y=2.D0*((1.D0-W)**2)/(LAN*(RED**2))
      PDWELL=X+Y+DLOG(RED)-0.75D0
 1111 WRITE(21,400)TD,PDWELL
 400  FORMAT(D20.2,3X,D20.5)
 200  CONTINUE
      DELTD=DELTD*10.D0
 500  CONTINUE
      GO TO 5040
C *********************************
C PRESSURE BUILD-UP (HORNER ANALYSIS)
C *********************************
 550  DELTD=0.001D0
      DO 1000 K=1,20
      X=(TPD+DELTD)/DELTD
      Y=TPD+DELTD
      TD=Y
      Z1=PWD(TD)
      TD=DELTD
      Z2=PWD(TD)
      PDS=Z1-Z2
      XZ=(TPD+DELTD)/DELTD
      WRITE(21,410)XZ,PDS
 410  FORMAT(D20.9,5X,D20.9)
      DELTD=DELTD*10.D0
 1000 CONTINUE
      GO TO 5040
C ******************************
C     MUSKAT ANALYSIS
C ******************************
 560  PIRED=3.141592654D0*(RED**2)
      TPDA=TPD/(PIRED)
      T1=2.D0*(3.141592654D0)*TPDA
      DELTDA=0.001D0
      DO 2000 J=1,15
      X=TPDA+DELTDA
      Y=DELTDA
      TD=X
      P1=PWD(TD)
      TD=Y
      P2=PWD(TD)
      PMUSK=P1-P2-T1
      WRITE(21,240)DELTDA,PMUSK
 240  FORMAT(D20.9,5X,D20.9)
      DELTDA=DELTDA+0.005D0
 2000 CONTINUE
      GO TO 5040
C
C     INTERFERENCE ANALYSIS
C
 570  DELTD=1.D0
      DO 15 K=1,10
      TD=0.D0
      DO 14 J=1,9
      TD=TD+DELTD
      PFORM=(RD**2)*PWD(TD)
      WRITE(21,600)TD,PFORM
 600  FORMAT(D20.9,5X,D20.9)
 14   CONTINUE
      DELTD=DELTD*10.D0
 15   CONTINUE
```

```
          GO TO 5040
C
C         MUSKAT ANALYSIS. WARREN AND
C         ROOT SOLUTION FOR A CLOSED SYSTEM.
C
  580     X=(2.D0*TPD)/((RED**2)*(RED**2-1.D0))
          Y=LAN/W*(1.D0-W)
          Z=2.D0*((1.D0-W)**2)/((RED**2-1.D0)*LAN)
          X1=DEXP(-Y*TPD)
          DELTD=0.001D0
          DO 5915 K=1,10
          TD=0.D0
          DO 219 J=1,9
          TD=TD+DELTD
          X2=DEXP(-Y*TD)
          PMUSK=X+Z*X2*(1.D0-X1)
          WRITE(21,5914)TD,PMUSK
  5914    FORMAT(D20.9,5X,D20.9)
  219     CONTINUE
          DELTD=DELTD*10.D0
  5915    CONTINUE
          GO TO 5040
C
C
C
C         BUILD-UP ANALYSIS
C         CLOSED SYSTEM.  NUMERICAL
C         INVERTOR SOLUTION. MUSKAT TYPE.
C
C
C
  590     TPDA=(2.D0*TPD)/(RED**2)
          PIRED=3.141592654D0*(RED**2)
          TD=TPD
          PMUSK=PWD(TD) -TPDA
          X=0.D0
          WRITE(21,5151)X,PMUSK
  5151    FORMAT(D20.9,5X,D20.9)
          DELTDA=0.001D0
          DO 1001 K=1,15
          DELTD=0.D0
          DO 1011 J=1,9
          DELTD=DELTD+DELTDA
          X=TPD+DELTD
          TD=X
          Z1=PWD(TD)
          TD=DELTD
          Z2=PWD(TD)
          PMUSK=Z1-Z2-TPDA
          WRITE(21,1515)DELTD/PIRED,PMUSK
  1515    FORMAT(D20.9,5X,D20.9)
  1011    CONTINUE
          DELTDA=DELTDA*10.D0
  1001    CONTINUE
          GO TO 5040
C
C         MUSKAT ANALISYS. WARREN AND ROOT
C         SOLUTION USING TDA AS A INDEPENDENT
C         VARIABLE.
  601     PIRED=3.141592654D0*(RED**2)
```

```
      TPDA=TPD/PIRED
      XN=2.D0*3.141592654D0*TPDA
      XB=RED**2-1.D0
      X1=XN/XB
      YN=2.D0*((1.D0-W)**2)
      X2=YN/(XB*LAN)
      X3=(LAN*PIRED)/W*(1.D0-W)
      X31=X3*TPDA
      IF(X31.GT.100)X31=100
      X4=DEXP(-X31)
      X5=1.D0-X4
      DELTDA=0.00000001D0
      DO 6666 K=1,15
      DELTD=0.D0
      DO 6665 J=1,9
      DELTD=DELTD+DELTDA
      X6=DEXP(-X3*DELTD)
      PMUSK=X1+X2*X6*X5
      WRITE(21,6664)DELTD,PMUSK
 6664 FORMAT(D20.9,5X,D20.9)
 6665 CONTINUE
      DELTDA=DELTDA*10.D0
 6666 CONTINUE
      GO TO 5040
C     CASE.16: MUSKAT PLOT INTERCEPT
C              VERSUS PRODUCING TIRE. WARREN
C              AND ROOT SOLUTION.
 602  PIRED=3.141592654D0*(RED**2)
      X=2.D0*((1.D0-W)**2)
      Y=LAN*(RED**2)
      T1=X/Y
      Z=LAN*PIRED
      Z1=W*(1.D0-W)
      T2=Z/Z1
      DELTDA=1.D-06
      DO 8888 K=1,10
      DELTD=0.D0
      DO 8885 J=1,9
      DELTD=DELTD+DELTDA
      T3=T2*DELTD
      IF(T3.GT.100.D0)T3=100.D0
      X11=(2.D0*3.141592654D0)/(RED**2-1.D0)
      PMUSK=T1*(1.D0-DEXP(-T3)) +(X11*DELTD)
      WRITE(21,8884)DELTD,PMUSK
 8884 FORMAT(D20.9,5X,D20.9)
 8885 CONTINUE
      DELTDA=DELTDA*10.D0
 8888 CONTINUE
 5040 STOP
      END
C
C
      FUNCTION PWDL(S)
C
      IMPLICIT REAL*8(A-H,O-Z)
      COMMON/LPL/N
      REAL*8 LAN,IO,KO,K1,I1,IOX,KOX
      REAL*8 NUM,DEN,B1,B2 ,PIRED
      REAL*8 K1X,I1X,I1Y,K1Y,IOZ,KOZ
      COMMON/FRAC/W,LAN,CD,SKIN,RED,RD,CASE,TD
```

```
         UP=LAN+S*W*(1.D0-W)
         DAWMN=(1.D0-W)*S+LAN
         FS=UP/DAWMN
C        FS=(LAN+S*W*(1.D0-W))/((1.D0-W)*S+LAN)
         SF=S*FS
         X=DSQRT(SF)
      Y=DSQRT(SF)*RED
      Z=DSQRT(SF)*RD
      IF(CASE.EQ.5.OR.CASE.EQ.3)GO TO 5510
      IF(CASE.EQ.4.OR.CASE.EQ.6)GO TO 5520
      IF(CASE.EQ.7)GO TO 5520
      IF(CASE.EQ.8.OR.CASE.EQ.9)GO TO 5530
      IF(CASE.EQ.11.OR.CASE.EQ.12)GO TO 5540
      IF(CASE.EQ.14)GO TO 5520
C *************************************
C     FLOW RATE
C *************************************
      IF(CASE.EQ.2)GOTO 1111
      PIRED=3.141592654D0*(RED**2)
      TDW=TD/W
      TDAW=TDW/PIRED
      IF (TDAW.LT.0.1D0)GO TO 1111
      K1Y=BESK1(Y)
      K1X=BESK1(X)
      I1X=BESI1(X)
      I1Y=BESI1(Y)
      IOX=BESI0(X)
      KOX=BESK0(X)
C
C     SOLVING FOX  QWDL
C
      NUM=X*(I1Y*K1X-K1Y*I1X)
      B1=K1Y*IOX+I1Y*KOX
      B2=K1Y*I1X-K1X*I1Y
      DEN=S*(B1-X*SKIN*B2)
C
      PWDL=NUM/DEN
C
      GO TO 1112
 1111 K1X=BESK1(X)
      KOX=BESK0(X)
      NUM=X*K1X
      DEN=S*(KOX+X*SKIN*K1X)
C
      PWDL=NUM/DEN
C
C *************************************
C     PRESSURE
C *************************************
      GO TO 1112
C
C     INFINITE SYSTEM
C
 5510 KO=BESK0(X)
      K1=BESK1(X)
      TOP=KO+SKIN*K1*X
      BOT=S*(K1*X+CD*S*TOP)
      PWDL=TOP/BOT
      GO TO 1112
 5520 PIRED=3.141592654D0*(RED**2)
```

```
      TDW=TD/W
      TDAW=TDW/PIRED
      TDAW=1.D0
      IF(TDAW.LT.0.10D0)GO TO 5510
C
C     CLOSED SYSTEM
C
       K1Y=BESK1(Y)
      I0Z=BESI0(Z)
      K0Z=BESK0(Z)
      I1Y=BESI1(Y)
      K1X=BESK1(X)
      I1X=BESI1(X)
      TOP=K1Y*I0Z+K0Z*I1Y
      BOT1=K1X*I1Y-K1Y*I1X
      BOT=S*X*BOT1
      PWDL=TOP/BOT
      GO TO 1112
C
C     INTERFERENCE ANALYSIS.
C     INFINITE SYSTEM. CONSTANT RATE.
 5530 K0Z=BESK0(Z)
      K1X=BESK1(X)
      K0X=BESK0(X)
      NUM=K0Z
      DEN1=X*K1X
      DEN2=K0X+SKIN*DEN1
      BOT=S*(DEN1+S*CD*DEN2)
      IF(CASE.EQ.9)GO TO 5531
C
C     FRACTURE SOLUTION
C
      PWDL=NUM/BOT
      GO TO 1112
C
C     MATRIX SOLUTION
C
 5531 X=LAN*(NUM/BOT)
      Y=S*(1.D0-W)+LAN
      PWDL=X/Y
      GO TO 1112
C
C     INTERFBRENCE ANALYSIS. INFINITE
C     SYSTEM. CONSTANT INNER PRESSURE.
C
 5540 K0Z=BESK0(Z)
      K0X=BESK0(X)
      K1X=BESK1(X) .
      DEN=K0X+SKIN*K1X*X
      IF(CASE.EQ.12)GO TO 5541
C
C     FRACTURE SOLUTION. CONSTANT
C     INNER PRESSURE.
C
      PWDL=K0Z/(S*DEN)
      GO TO 1112
C
C     MATRIX SOLUTION. CONSTANT INNER
C     PRESSURE.
C
```

```
 5541 BOT=S*(1.D0-W)+LAN
      PWDL=(LAN*KOZ)/(BOT*DEN)
 1112 RETURN
C************************************
      END
C************************************
      FUNCTION PWD(TD)
C     ***************
C
C     THIS FUNCTION COMPUTES THE DIMENSIONLESS WELLBORE
C     PRESSURE AS A FUNCTICN OF THE DIMENSICNLESS TIME TD,
C     BY COMPUTING THE LAPLACE TRANSFORM IKVERSE OF PWDL(S),
C     BY STEHFEST NUMERICAL APPROXIMATION.
C
C     DATA INPUT:
C     ===========
C
C     FUNCTION PWDL(S).
C     VALUE OF DIMENSIONLESS TIME: TD.
C     NUMBER OF TERMS TO BE USED IN APPROXIMATING PWD: N.
C     (N MUST BE AN EVEN NUMBER).
C
C     DATA OUTPUT:
C     ============
C
C     APPROXIMATED VALUE OF THE DIMENSIONLESS PRESSURE
C     AT THE WELLBORE: PWD.
C
C     ***************
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION G(50),V(50),H(25)
        DATA N/16/
      DATA ISWT/0/
C
C     EXECUTABLE PROGRAM:
C     ==================
C
      IF(ISWT)1,1,14
C     CONSTANT TERMS ARE EVALUATED:
    1 ISWT=1
      DLOGTW=.6931471805599453
      NH=N/2
C     THE FACTORIAL OF THE INTEGERS RANGING FROM
C     1 THROUGH N ARE COMPUTED INTO ARRAY G:
      G(1)=1.
      DO 2 I=2,N
    2 G(I)=G(I-1)*I
C     THE TERMS 'DEPENDENT ON K ONLY' ARE COMPUTED, AND
C     STORED IN ARRAY H:
      H(1)=2./G(NH-1)
      DO 5 I=2,NH
      FI=I
      IF(I-NH)3,4,5
    3 H(I)=FI**NH*G(2*I)/(G(NH-I)*G(I)*G(1-11))
      GO TO 5
    4 H(I)=FI**NH*G(2*I)/(G(I)*G(I-1))
    5 CONTINUE
C     THE TERM SN=(-1)**(N/2+I) IS COHPUTED FOR I=1:
      SN=2*(NH-NH/2*2)-1
```

```
C     COMPUTATION OF ARRAY V IS STARTED:
      DO 13 I=1,N
      V(I)=0.
C     LOWER AND UPPER INDICES IN SUMATION TERMS
C     ARE EVALUATED:
C     K1=INTG((I+1)/2), AND K2=MIN(I,N/2):
      K1=(I+1)/2
      K2=I
      IF(K2-NH)7,7,6
    6 K2=NH
C     SUMATION TERM IS COMPUTED:
    7 DO 12 K=K1,K2
      IF(2*K-I)8,10,8
    a IF(I-K)9,11,9
    9 V(I)=V(I)+H(K)/(G(I-K)*G(2*K-I))
      GO TO 12
   10 V(I)=V(I)+H(K)/G(I-K)
      GO TO 12
   11 V(I)=V(I)+H(K)/G(2*K-I)
   12 CONTINUE
C     COEFFICIENT VI IS COMPUTED:
      V(I)=SN*V(I)
C     THE TERM SN=(-1)**(N/2+L) IS COMPUTED FOR L=I+1:
      SN=-SN
   13 CONTINUE
C     THE NUMERICAL APPROXIMATION OF THE LAPLACE TRANSFORM
C     INVERSE FOR PWDL(S) IS COMPUTED:
   14 PWD=0.
      A=DLOGTW/TD
      DO 15 I=1,N
      ARG=I*A
   15 PWD=PWD+V(I)*PWDL(ARG)
      PWD=A*PWD
      RETURN
C
C     ****************
C
      END
C
```