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Two-variate Exponential Distribution and Its Numerical Table for Engineering Application

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Abstract

This study aims to develop the fundamental theory of a two-variate gamma distribution, especially of a two-variate exponential distribution for engineering application. In outline, the study is as follows:

(1) Methods of estimating the parameters included in the probability density function of the distribution, the shape parameter in the marginal distribution of which is the same in each, are developed by using the techniques of maximum likelihood and moments. The results show that the estimator for the correlation parameter by the latter is coincident with the ordinary Pearsonian definition of correlation coefficient, but that by the former is not.

(2) The characteristics of the two-variate exponential distribution, which is a special type of gamma distribution, especially the characteristics of a correlation surface and locus of the mode of the conditional probability density function are clarified theoretically and numerically in relation to the correlation parameters.

(3) For convenience of engineering application of two-variate exponential distribution, numerical values of the conditional probability function are provided in a table. That is, for the fixed values of one variate, the computational values of the other variate are prepared under various conditional probabilities and correlation parameters.

1. Introduction

In designing systems for flood control and water resources, there are many problems which should be analyzed by considering the correlation between variables such as river flow discharges at several gauging stations, rainfall depths at various locations, rainfall depth and discharge sequences, flood discharge and its duration, and so on. This situation compels river engineers to recognize the importance of the theory of multi-variate statistical analysis and to introduce it into their design procedure. In fact, stochastic techniques such as regression analysis and data generation have recently played an important role in a systems approach to the problems of flood control and water resources.

In most cases a technique based on a normal distribution is applied; however not all hydrologic quantities follow the normal distribution but rather a skewed one having positive skewness in many cases. So, special devices must be introduced to cope with this. One such expedient is to normalize the distribution of hydrologic quantities in any of the usual ways; but a more basic way is to develop a statistical theory for multi-variate following a skewed distribution.

This study aims to develop a fundamental theory of multi-variate gamma distribution, regarded as a useful type for skewed distribution because the

gamma distribution, also called Pearson type III distribution, may have a great variety of shapes from a symmetrical curve near a normal distribution to an extremely asymmetrical curve such as an exponential distribution, according to the selection of the parameters included in the distribution function.

There are only a few studies available on multi-variate gamma distribution. Kibble's¹⁾ work might be regarded as the pioneering work in this field. He derived a two-variate gamma distribution and showed it as a series bilinear in Laguerre polynomials. Moreover, he showed that it can be expressed in terms of a modified Bessel function, if the two variates have the same shape parameter. Cherian²⁾ also derived a two-variate gamma distribution with a definite value for the correlation coefficient. Krishnamoorthy and Parthasarathy^{3),4)} expanded Kibble's work to multi-variate gamma distribution. Izawa^{5),6)} investigated the fundamental characteristics of two-variate gamma distribution from the viewpoint of statistical meteorology. Gumbel⁷⁾ and Freund⁸⁾ discussed some special types of two-variate exponential distributions.

These studies seem to be for mathematical interest only, so it is hard to use their results directly in engineering practice. As the first step of our study, the fundamental theory of two-variate exponential distribution is developed after some discussion of a two-variate gamma distribution, and a numerical table of conditional probabilities of the two-variate exponential distribution is prepared in this paper for the convenience of engineering practice.

2. Two-variate Gamma Distribution

2.1. Definition and fundamental relations

The probability density function of one-variate gamma distribution is defined by the following well-known equation,

$$f(x) = \frac{1}{\beta^\nu \Gamma(\nu)} \exp\left(-\frac{x}{\beta}\right) x^{\nu-1}, \quad x \geq 0 \quad (1)$$

where ν and β are the parameters sometimes called shape parameter and scale parameter, respectively. The expectation, $E(x)$, and the variance, $D^2(x)$, of the variable, x , are given by

$$E(x) = \beta\nu, \quad D^2(x) = \beta^2\nu \quad (2)$$

The particular case for $\nu=1$ in Eq.(1) is known as an exponential distribution and for $\beta=2$ as a χ^2 -distribution with 2ν degree of freedom.

Now, the general form of two-variate gamma distribution function whose marginal distributions have the different shape parameters ν_1 and ν_2 ($\nu_1 \neq \nu_2$) was defined by Izawa¹⁾; but we will start this discussion from the definition of the distribution function where each shape parameter is the same, e. g. $\nu_1 = \nu_2 = \nu$. In this case, the probability density function $f(x_1, x_2)$ is given by the following equation;

$$f(x_1, x_2) = \frac{1}{\Gamma(\nu)(\sigma_1, \sigma_2)^{\frac{\nu+1}{2}} (1-\rho)^{\frac{\nu-1}{2}}} \exp\left\{-\frac{x_1}{\sigma_1(1-\rho)} - \frac{x_2}{\sigma_2(1-\rho)}\right\} \\ \times (x_1 x_2)^{\frac{\nu-1}{2}} I_{\nu-1}\left(\frac{2\sqrt{\rho}}{1-\rho} \sqrt{\frac{x_1 x_2}{\sigma_1 \sigma_2}}\right) \quad (3)$$

where $\Gamma(\nu)$ shows the gamma function and $I_{\nu-1}(z)$ the modified Bessel function with argument $(\nu-1)$ as defined as follows:

$$\Gamma(z) = \int_0^\infty e^{-t} t^{z-1} dt, \quad I_\nu(z) = \sum_{n=0}^\infty \frac{z^{\nu+2n}}{2^{\nu+2n} n! \Gamma(\nu+n+1)}$$

and σ_1, σ_2 and ρ are the constants. As pointed out by Izawa, if the correlation parameter, ρ , is negative or positive larger than unity, the value of z in $I_{\nu-1}(z)$ becomes imaginary or negative and the density function takes the negative or imaginary value according to the value of ν . Therefore, ρ must be in the range $0 \leq \rho \leq 1$.

The marginal probability density function, $f_1(x_1)$, of x_1 and, $f_2(x_2)$, of x_2 , respectively, and the conditional probability density function, $f(x_1|x_2)$, of x_1 for a given value, x_2 , are defined easily from Eq. (3) as follows :

$$\left. \begin{aligned} f_1(x_1) &\equiv \int_0^\infty f(x_1, x_2) dx_2 = \frac{1}{\Gamma(\nu)\sigma_1^\nu} x_1^{\nu-1} \exp\left(-\frac{x_1}{\sigma_1}\right) \\ f_2(x_2) &\equiv \int_0^\infty f(x_1, x_2) dx_1 = \frac{1}{\Gamma(\nu)\sigma_2^\nu} x_2^{\nu-1} \exp\left(-\frac{x_2}{\sigma_2}\right) \end{aligned} \right\} \quad (4)$$

$$\begin{aligned} f(x_1|x_2) &\equiv \frac{f(x_1, x_2)}{f_2(x_2)} = \frac{\sigma_2^\nu}{(\sigma_1\sigma_2)^{\frac{\nu+1}{2}} (1-\rho)\rho^{\frac{\nu-1}{2}}} \left(\frac{x_1}{x_2}\right)^{\frac{\nu-1}{2}} \\ &\times \exp\left[-\frac{x_1}{\sigma_1(1-\rho)} - \frac{x_2}{\sigma_2(1-\rho)}\right] I_{\nu-1}\left(\frac{2\sqrt{\rho}}{1-\rho}\sqrt{\frac{x_1x_2}{\sigma_1\sigma_2}}\right) \end{aligned} \quad (5)$$

Moreover, the conditional mean corresponding to the regression curve, $E(x_1|x_2)$, and the conditional variance, $D^2(x_1|x_2)$, of x_1 for a given value, x_2 , are shown as follows :

$$E(x_1|x_2) = \nu\sigma_1 + \frac{\sigma_1}{\sigma_2}\rho(x_2 - \nu\sigma_2) \quad (6)$$

$$D^2(x_1|x_2) = \nu\sigma_1^2(1-\rho)^2 + 2\frac{\sigma_1^2}{\sigma_2}\rho(1-\rho)x_2 \quad (7)$$

These results given by Izawa are important as the basis of the following considerations.

2. 2. Estimation of parameters

In order to apply two-variate gamma distribution to engineering practice, it is necessary to estimate the unknown parameters, σ_1, σ_2 and ρ , included in the distribution function. But it seems that such a theory for two-variate gamma distribution is not developed yet except in Izawa's work for a two-variate exponential distribution applying the maximum likelihood method. Therefore, we try to develop the theories for estimating the parameters by using the methods of maximum likelihood and moments for two-variate gamma distribution.

(1) Estimation by the maximum likelihood method

Under the hypothesis that ν is known, for a sample of n 's pairs of (x_{1i}, x_{2i}) ($i=1, 2, \dots, n$) from a two-dimensional population, whose probability density function is given by Eq. (3), is defined by

$$\begin{aligned} P_n &= \frac{1}{\left\{\Gamma(\nu) \cdot (\sigma_1\sigma_2)^{\frac{\nu+1}{2}} (1-\rho)\sigma^{\frac{\nu-1}{2}}\right\}^n} \prod_{i=1}^n (x_{1i}x_{2i})^{\frac{\nu-1}{2}} \\ &\times \exp\left[-\frac{1}{\sigma_1(1-\rho)} \sum_{i=1}^n x_{1i} - \frac{1}{\sigma_2(1-\rho)} \sum_{i=1}^n x_{2i}\right] \times \prod_{i=1}^n I_{\nu-1}\left(\frac{2\sqrt{\rho}}{\sqrt{\sigma_1\sigma_2}(1-\rho)}\sqrt{x_{1i}x_{2i}}\right) \end{aligned} \quad (8)$$

And the likelihood equations with respect to unknown parameters become as follows :

$$\frac{\partial(\log P_n)}{\partial \sigma_1} = \frac{\partial(\log P_n)}{\partial \sigma_2} = \frac{\partial(\log P_n)}{\partial \rho} = 0$$

Considering the relations $I'_\nu(z) = \{I_{\nu-1}(z) + I_{\nu+1}(z)\}/2$ and $I_{\nu-1}(z) - I_{\nu+1}(z) = (2\nu/z) \times I_\nu(z)$, the solution by the maximum likelihood method is given by the following forms

$$\hat{\sigma}_1 = \frac{1}{n\nu} \sum_{i=1}^n x_{1i}, \quad \hat{\sigma}_2 = \frac{1}{n\nu} \sum_{i=1}^n x_{2i} \tag{9}$$

$$\nu\sqrt{\hat{\rho}} = \frac{1}{n} \sum_{i=1}^n \frac{I_\nu\left(\frac{2\sqrt{\hat{\rho}}\xi_i\eta_i}{1-\hat{\rho}}\right)}{I_{\nu-1}\left(\frac{2\sqrt{\hat{\rho}}\xi_i\eta_i}{1-\hat{\rho}}\right)} \sqrt{\xi_i\eta_i} \tag{10}$$

where ξ_i and η_i are the standardized variables defined as follows :

$$\xi_i = \frac{x_{1i}}{\hat{\sigma}_1}, \quad \eta_i = \frac{x_{2i}}{\hat{\sigma}_2} \tag{11}$$

From this we conclude that the scale parameters, σ_1 and σ_2 , can easily be estimated from the mean value in the one-dimensional sense but the correlation parameter, ρ , is estimated only by an indirect method such as iterational procedure, because it is implicitly contained in Eq. (10).

(2) *Estimation by the moments method*

The product moment of the joint distribution of the variables x_1 and x_2 is written by the following

$$\begin{aligned} \nu_{pq} &\equiv \int_0^\infty \int_0^\infty x_1^p x_2^q f(x_1, x_2) dx_1 dx_2 = C_1 \int_0^\infty x_2^{\frac{\nu-1}{2}+q} \exp\left\{-\frac{x_2}{\sigma_2(1-\rho)}\right\} dx_2 \\ &\quad \times \int_0^\infty x_1^{\frac{\nu-1}{2}+p} \exp\left\{-\frac{x_1}{\sigma_1(1-\rho)}\right\} \cdot I_{\nu-1}\left(\frac{2\sqrt{\rho}x_2}{\sqrt{\sigma_1\sigma_2(1-\rho)}}\sqrt{x_1}\right) dx_1 \end{aligned} \tag{12}$$

in which

$$C_1 = \frac{1}{\Gamma(\nu) \cdot (\sigma_1\sigma_2)^{\frac{\nu+1}{2}} (1-\rho)^{\frac{\nu-1}{2}}}$$

and both p and q are non-negative integers. Using the transformation of $x_1 = \sqrt{z}$, the integral term of x_1 , I_1 , becomes as follows⁹⁾:

$$\begin{aligned} I_1 &= \int_0^\infty x_1^{\frac{\nu-1}{2}+p} \exp\left\{-\frac{x_1}{\sigma_1(1-\rho)}\right\} I_{\nu-1}\left(\frac{2\sqrt{\rho}}{\sqrt{\sigma_1\sigma_2(1-\rho)}}\sqrt{x_1}\right) dx_1 \\ &= C_2 \frac{\Gamma(\nu+p)}{\Gamma(\nu)} \rho^{\frac{\nu-1}{2}} (1-\rho)^{p+1} \sigma_1^{p+\frac{\nu+1}{2}} x_2^{\frac{\nu-1}{2}} {}_1F_1(\nu+p; \nu; \frac{\rho}{\sigma_2(1-\rho)} x_2) \end{aligned} \tag{13}$$

$$C_2 = \sigma_2^{-\frac{\nu-1}{2}}$$

in which ${}_1F_1(\alpha; \gamma; z)$ is a degenerate hypergeometric function defined by

$${}_1F_1(\alpha; \gamma; z) = \frac{\Gamma(\gamma)}{\Gamma(\alpha)} \sum_{n=0}^\infty \frac{\Gamma(\alpha+n)}{\Gamma(\gamma+n)} \frac{z^n}{n!}$$

Therefore, the product moment can be written as follows¹⁰⁾:

$$\begin{aligned} \nu_{pq} &= C_1 C_2 \int_0^\infty \exp\left\{-\frac{x_2}{\sigma_2(1-\rho)}\right\} x_2^{\nu+q-1} {}_1F_1(\nu+p; \nu; \frac{\rho}{\sigma_2(1-\rho)} x_2) dx_2 \\ &= \frac{\Gamma(\nu+p)\Gamma(\nu+q)}{\{\Gamma(\nu)\}^2} (1-\rho)^{p+q+\nu} \sigma_1^p \sigma_2^q F(\nu+p; \nu+q; \nu; \rho) \end{aligned} \tag{14}$$

where $F(a; b; c; z)$ is a hypergeometric function defined by

$$F(a; b; c; z) = \frac{\Gamma(c)}{\Gamma(a)\Gamma(b)} \sum_{n=0}^{\infty} \frac{\Gamma(a+n)\Gamma(b+n)}{n!\Gamma(c+n)} z^n$$

Thus, substituting 0, 1, 2 for p and q practically, the following relations are obtained :

$$\left. \begin{aligned} \nu_{10} &= \nu\sigma_1, & \nu_{20} &= \nu(\nu+1)\sigma_1^2 \\ \nu_{01} &= \nu\sigma_2, & \nu_{02} &= \nu(\nu+1)\sigma_2^2 \\ \nu_{11} &= \nu(\nu+\rho)\sigma_1\sigma_2 \end{aligned} \right\} \quad (15)$$

That is, the following momentum equalities hold for the 1st and 2nd moments calculated from the sample of n 's pairs (x_{1i}, x_{2i}) ($i=1, 2, \dots, n$)

$$\begin{aligned} \frac{1}{n} \sum_{i=1}^n x_{1i} &\equiv \bar{x}_1 = \nu\sigma_1, & \frac{1}{n} \sum_{i=1}^n x_{2i} &\equiv \bar{x}_2 = \nu\sigma_2 \\ \frac{1}{n} \sum_{i=1}^n x_{1i}^2 &\equiv \overline{x_1^2} = \nu(\nu+1)\sigma_1^2, & \frac{1}{n} \sum_{i=1}^n x_{2i}^2 &\equiv \overline{x_2^2} = \nu(\nu+1)\sigma_2^2 \\ \frac{1}{n} \sum_{i=1}^n x_{1i}x_{2i} &\equiv \overline{x_1x_2} = \nu(\nu+\rho)\sigma_1\sigma_2 \end{aligned}$$

Therefore, the estimators for the parameters by the moments method are given by

$$\left. \begin{aligned} \hat{\nu} &= \frac{(\bar{x}_1)^2}{x_1^2 - (\bar{x}_1)^2} = \frac{(\bar{x}_2)^2}{x_2^2 - (\bar{x}_2)^2} \\ \hat{\sigma}_1 &= \frac{\overline{x_1^2} - (\bar{x}_1)^2}{\bar{x}_1}, & \hat{\sigma}_2 &= \frac{\overline{x_2^2} - (\bar{x}_2)^2}{\bar{x}_2} \\ \hat{\rho} &= \frac{\overline{x_1x_2} - \bar{x}_1\bar{x}_2}{\sqrt{\overline{x_1^2} - (\bar{x}_1)^2} \sqrt{\overline{x_2^2} - (\bar{x}_2)^2}} \end{aligned} \right\} \quad (16)$$

For the shape parameter, σ , the solution by the maximum likelihood is the same as the one by the moments method; and for the correlation parameter, ρ , the solution by the moments method is coincident with the ordinary Pearsonian definition of correlation coefficient but the one by the maximum likelihood method is not.

Moreover, the estimators by the moments method are given by the following equalities, if the shape parameter ν is known.

$$\left. \begin{aligned} \hat{\sigma}_1 &= \frac{\bar{x}_1}{\nu}, & \hat{\sigma}_2 &= \frac{\bar{x}_2}{\nu} \\ \hat{\sigma}_1^2 &= \frac{\overline{x_1^2}}{\nu(\nu+1)}, & \hat{\sigma}_2^2 &= \frac{\overline{x_2^2}}{\nu(\nu+1)} \\ \hat{\rho} &= \frac{\nu\overline{x_1x_2}}{\bar{x}_1\bar{x}_2} - \nu \end{aligned} \right\} \quad (17)$$

3. Two-variate Exponential Distribution

3. 1. Fundamental relations

It is well known that the one-variate exponential distribution, which is a special type of the one-variate gamma distribution as mentioned above, plays an important role in the frequency analysis of hydrological quantities. Therefore, developing the theory of the two-variate exponential distribution as a special type of the two-variate gamma distribution is to be useful in engineering practice.

The various characteristics of the two-variate exponential distribution can be easily reduced by using the above-mentioned relations. By using the same notation as before, the fundamental relations are summarized as follows :

Probability density function :

$$f(x_1, x_2) = \frac{1}{\sigma_1 \sigma_2 (1-\rho)} \exp\left[-\frac{x_1}{\sigma_1(1-\rho)} - \frac{x_2}{\sigma_2(1-\rho)}\right] \cdot I_0\left(\frac{2\sqrt{\rho}}{1-\rho} \sqrt{\frac{x_1 x_2}{\sigma_1 \sigma_2}}\right) \quad (18)$$

Marginal distribution function :

$$f_1(x_1) = \frac{1}{\sigma_1} \exp\left(-\frac{x_1}{\sigma_1}\right), \quad f_2(x_2) = \frac{1}{\sigma_2} \exp\left(-\frac{x_2}{\sigma_2}\right) \quad (19)$$

Conditional probability density function :

$$f(x_1 | x_2) = \frac{1}{\sigma_1(1-\rho)} \exp\left[-\frac{x_1}{\sigma_1(1-\rho)} - \frac{\rho x_2}{\sigma_2(1-\rho)}\right] \cdot I_0\left(\frac{2\sqrt{\rho}}{1-\rho} \sqrt{\frac{x_1 x_2}{\sigma_1 \sigma_2}}\right) \quad (20)$$

Conditional mean :

$$E(x_1 | x_2) = \sigma_1 + \rho \frac{\sigma_1}{\sigma_2} (x_2 - \sigma_2) \quad (21)$$

Conditional variance :

$$D^2(x_1 | x_2) = \sigma_1^2 (1-\rho)^2 + 2 \frac{\sigma_1^2}{\sigma_2} \rho (1-\rho) x_2 \quad (22)$$

3. 2. Estimation of parameters

(1) *Estimation by the maximum likelihood method*

From Eqs. (9), (10) and (11), the following relations are obtained,

$$\left. \begin{aligned} \hat{\sigma}_1 &= \bar{x}_1, & \hat{\sigma}_2 &= \bar{x}_2 \\ \sqrt{\hat{\rho}} &= \frac{1}{n} \sum_{i=1}^n \frac{I_1\left(\frac{2\sqrt{\hat{\rho}} \xi_i \eta_i}{1-\hat{\rho}}\right)}{I_0\left(\frac{2\sqrt{\hat{\rho}} \xi_i \eta_i}{1-\hat{\rho}}\right)} \sqrt{\xi_i \eta_i} \end{aligned} \right\} \quad (23)$$

where

$$\xi_i = \frac{x_{1i}}{\hat{\sigma}_1}, \quad \eta_i = \frac{x_{2i}}{\hat{\sigma}_2} \quad (24)$$

In order to obtain the solution of ρ , the following procedure may be used.

First, defining such a new variable z_i as

$$z_i = \frac{2\sqrt{\hat{\rho}}}{1-\hat{\rho}} \sqrt{\xi_i \eta_i} \quad (i=1, 2, \dots, n) \quad (25)$$

and using a function $K(z_i)$

$$K(z_i) = \frac{I_1(z_i)}{I_0(z_i)} z_i = K(\hat{\rho}; \xi_i, \eta_i) \quad (26)$$

Eq. (23) is rewritten as follows :

$$\frac{2\hat{\rho}}{1-\hat{\rho}} = \frac{1}{n} \sum_{i=1}^n K(z_i) \quad (27)$$

The relation between z and $K(z)$ is shown as in Fig. 1. Therefore, if the first approximation of $\hat{\rho}$ is assumed, the value of z is obtained through Eq. (25), $K(z)$ through Fig. 1 and the second approximation of ρ through Eq. (27). This computation may be repeated until Eq. (27) is finally satisfied in a practical sense. In this computation, the selection of the first approximation of ρ is delicate. For this selection, it may be useful to adopt the solution by the moments method. However, there remains some doubt about the necessity of obtaining the exact solution through such a troublesome computation in practice because of the existence of errors in samples. That is, the following solution by the moments method may be sufficient for the estimation of the parameters from the viewpoint of engineering application.

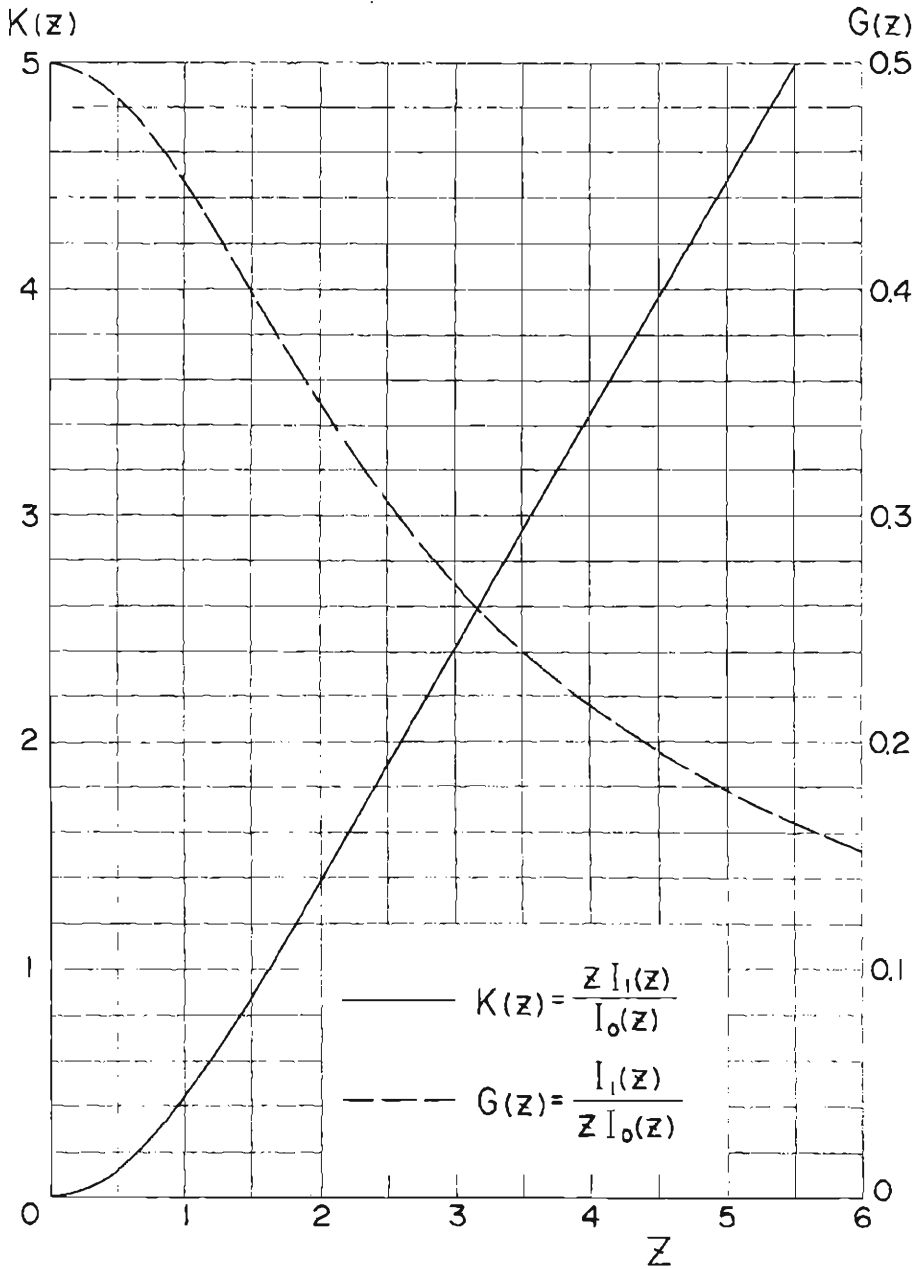


Fig.1. $K(z)$ and $G(z)$.

(2) Estimation by the moments method

From Eq. (14), the product moment for two-variate exponential distribution is given by the following,

$$\nu_{pq} = p! q! (1-\rho)^{p+q+1} \sigma_1^p \sigma_2^q F(p+1, q+1; 1; \rho) \tag{28}$$

Then, the solution by the moments method is obtained by using relations given by the above equation for $p, q=0, 1, 2$ or by using Eq. (17) in which parameter ν is taken as unity. The following equations show their solutions.

$$\left. \begin{aligned} \hat{\sigma}_1 &= \bar{x}_1, & \hat{\sigma}_2 &= \bar{x}_2 \\ \hat{\sigma}_1^2 &= \frac{1}{2} \overline{x_1^2}, & \hat{\sigma}_2^2 &= \frac{1}{2} \overline{x_2^2} \\ \rho &= \frac{\overline{x_1 x_2}}{\bar{x}_1 \bar{x}_2} - 1 \end{aligned} \right\} \tag{29}$$

3. 3. Probability density function

In this section, we investigate the characteristics of the probability density surface. The following considerations are for a distribution function in which every variable is standardized. Fig. 2 shows a form of the surface of the proba-

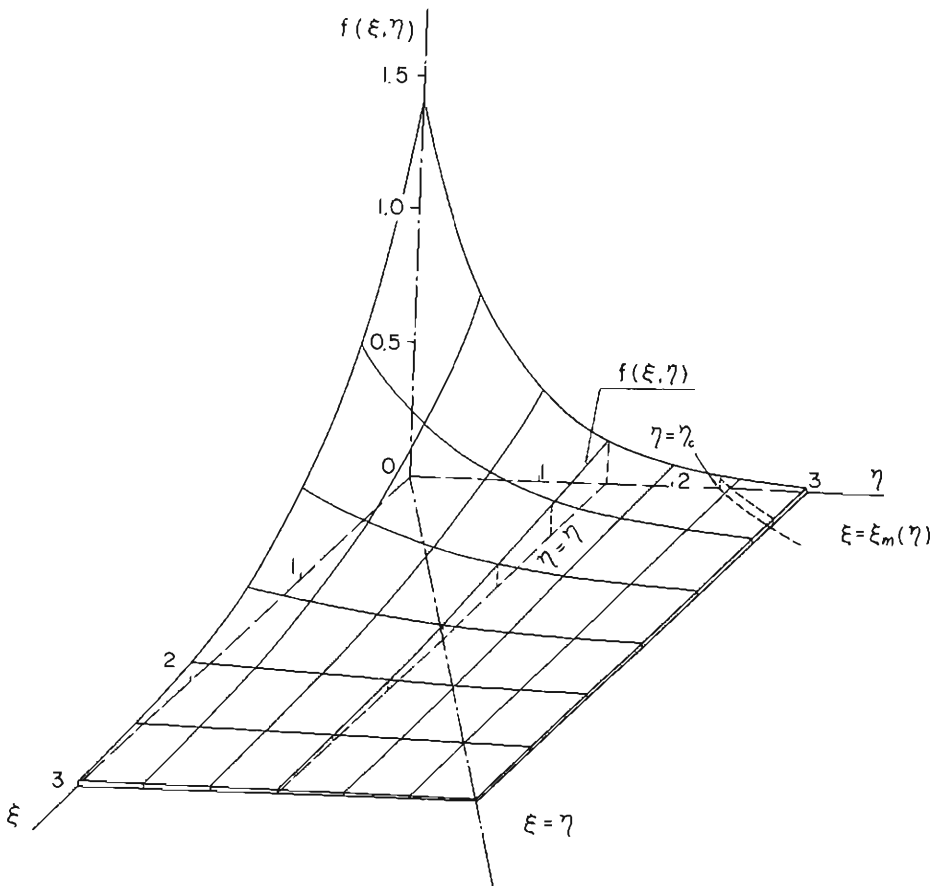


Fig. 2. Surface of two-variate exponential probability density function for $\rho=0.3$.

bility density function for $\rho=0.3$. Further information is obtained by considering the surface of $f=f(\xi, \eta)$ for a fixed value of η . For $\eta=0$, the curve of $f(\xi, \eta)$ is exponential as seen in the following equation,

$$f(\xi, \eta) = \frac{1}{1-\rho} \exp\left(-\frac{\xi}{1-\rho}\right)$$

and the value of $f(\xi, \eta)$ decreases in monotone with the increase of ξ . For $\eta = \text{const.} \neq 0$, the shape of the curve differs according to the value of η , and all its curvature is not monotone, but the probability density surface has a mode for $\eta > \eta_c$ in which η_c is some boundary value. However, it is difficult to know the details of this tendency in Fig. 2 directly according to the value of η . Fig. 3 (a)~(c) show examples of the intersection of the surface for some values of η . From these figures, the following tendencies are pointed out :

1) For the positive fixed value η , if ρ is greater than some value, the mode of probability density curve exists and the boundary value, η_c , diminishes with the increase of ρ .

2) The position of the mode moves to the positive direction of ξ according to the increase of ρ or η .

3) The degree of kurtosis about the mode grows smaller, the smaller the value ρ or the larger η .

In detail, the position of the mode is obtained by the following analytical treatment. Denoting the value of ξ , at which the mode exists, by ξ_m and putting

$\left[\frac{\partial f(\xi, \eta)}{\partial \xi} \right]_{\xi=\xi_m} = 0$, ξ_m is given by the following relations. ($\rho, \eta \neq 0$)

$$\frac{1-\rho}{2\rho} \frac{1}{\eta} = \frac{I_1(z)}{zI_0(z)} \equiv G(z) \quad (30)$$

$$z \equiv \frac{2\sqrt{\rho}}{1-\rho} \sqrt{\xi_m \eta} \quad (31)$$

in which $G(z)$ is a function of z and shown in Fig. 1.

Since the left hand in Eq. (30) becomes known for given values of ρ and η , and yet the value of z is found for $G(z)$ from Fig. 1, ξ_m is easily obtained from Eq. (31).

Next, the domain in which the mode exists is clarified as follows. By using the recursion formula of the modified Bessel function, the following equations are obtained.

$$\frac{I_1(z)}{zI_0(z)} = \frac{1}{2} \left\{ 1 - \frac{I_2(z)}{I_0(z)} \right\},$$

$$0 \leq I_2(z)/I_0(z) < 1 \text{ (the equality holds only for } z=0\text{).}$$

From these equations, it becomes clear that the mode exists only when the value of η satisfies the following relation

$$\eta \geq \frac{1-\rho}{\rho} \equiv \eta_c \quad (32)$$

By using the above results, the position of the mode of $f(\xi, \eta)$ for a fixed value η , can be calculated and the result is shown in Fig. 4 for the various values of ρ . It may be said from this figure that the locus of the mode for a given value of ρ will approach a straight line asymptotically with the increase of η .

This asymptotic line can be found by the following procedure. By using the

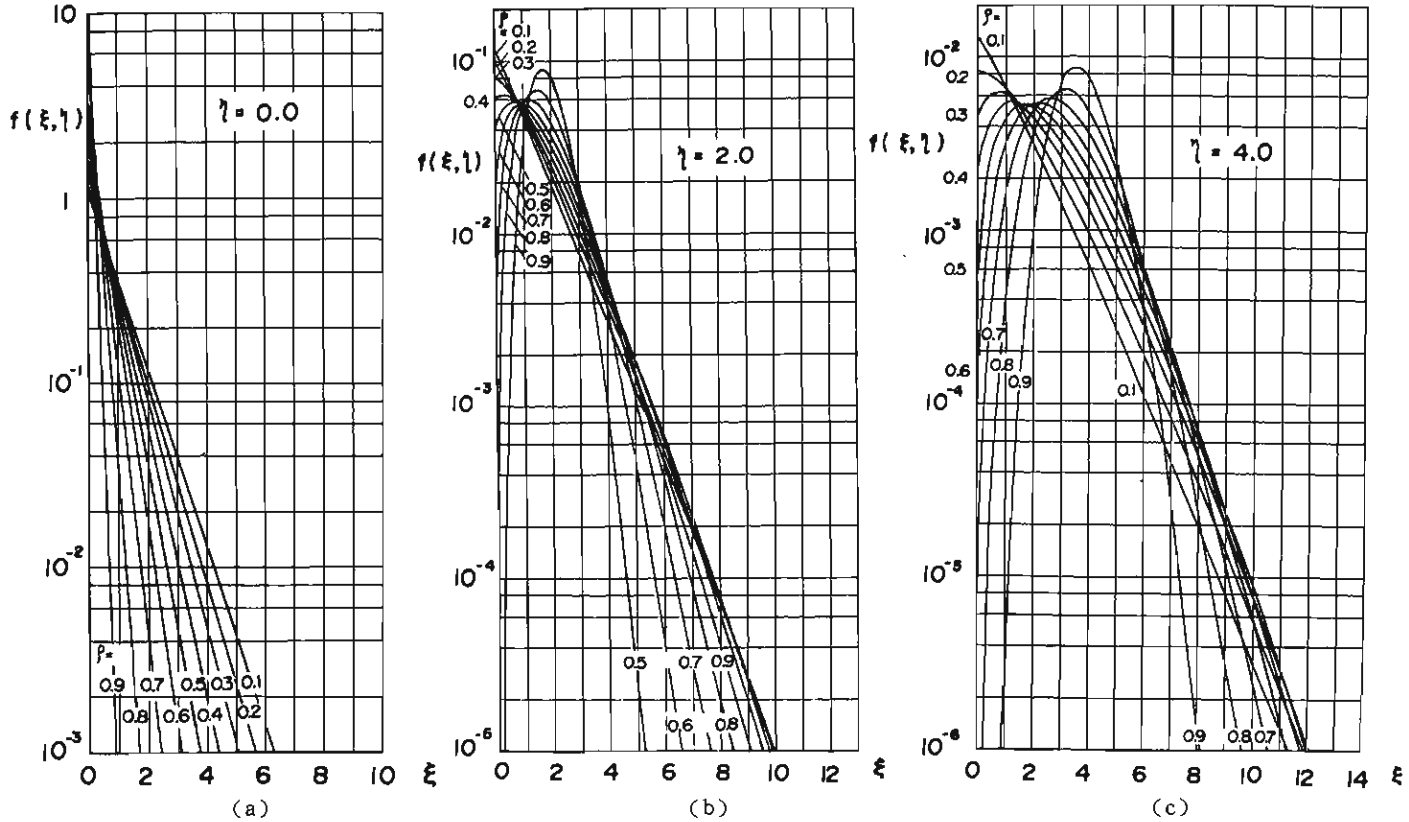


Fig.3. Intersections of two-variate exponential probability density surface.

asymptotic expansion of the modified Bessel function of large value of z ,

$$I_\nu(z) = \frac{e^z}{\sqrt{2\pi z}} \left\{ 1 - \frac{4\nu^2 - 1^2}{1!(8z)} + \frac{(4\nu^2 - 1^2)(4\nu^2 - 3^2)}{2!(8z)^2} - \dots \right\}$$

the power series of z for $I_1(z)/I_0(z)$ is given by

$$\frac{I_1(z)}{I_0(z)} = 1 - \frac{0.5}{z} - \frac{0.125}{z^2} - \dots$$

Substituting the above relation into Eq. (30) yields the following approximation

$$\frac{z^2}{\eta} = \frac{2\rho}{1-\rho} z \left(1 - \frac{0.5}{z} - \frac{0.125}{z^2} - \dots \right) = \frac{2\rho}{1-\rho} \left[\left(z - \frac{1}{2} \right) - O\left(\frac{1}{z} \right) \right] \quad (33)$$

Assuming that $O(1/z) \ll (z-1/2)$ and $1/2 \ll z$, Eq. (33) is rewritten by

$$\xi_m = \rho\eta - \frac{1-\rho}{4} \quad \text{or} \quad \eta = \frac{1}{\rho} \xi_m + \frac{1-\rho}{4\rho} \quad (34)$$

This is the objective equation of the asymptotic line.

3. 4. Conditional distribution function

Using Eq. (20) expressed in the standardized variables, the conditional distribution function $F(\xi | \eta)$, is defined by

$$F(\xi | \eta) = \int_0^\xi f(\xi | \eta) d\xi = \frac{1}{1-\rho} \exp\left(-\frac{\rho\eta}{1-\rho}\right) \int_0^\xi \exp\left(-\frac{\xi}{1-\rho}\right) I_0\left(\frac{2\sqrt{\rho}}{1-\rho} \sqrt{\xi\eta}\right) d\xi \quad (35)$$

Of course, it depends on the values ξ , η and ρ .

Two kinds of numerical table for $F(\xi | \eta)$ have been prepared for the convenience of practical computation. One is a table of $F(\xi | \eta)$ tabulated for $\eta = 0$ (0.25) 3.00(0.5)5(1)10(12)18, $\xi = 0$.25(0.25)10(0.5)14(1)18 and $\rho = 0$.1(0.1)0.9, in addition, $\xi = 0$.05(0.05)0.25 for $\rho \geq 0$.6¹¹⁾. The numerical computation was carried out by the following operational procedure. First, $f(\xi | \eta)$ was computed for given values of ρ , η and ξ , the interval of which was given by at least 0.005 if necessary. Next, the integration was done by using the Newton-Cotes integration formula. This computation was done by KDC II (Kyoto University Digital Computer II).

The other is a table compiled from the former, taking into account other conveniences such as data generation. For this compilation, considerable supplemental computations and interpolations of numerical value were carried out by a digital computer, FACOM 230-60 in Kyoto University. In this new table, as seen in Table 1-9, the value of ξ has been shown for $F(\xi | \eta) = 0$.001(0.001)0.01(0.01)0.20(0.05)0.80(0.01)0.99(0.001)0.999, $\eta = 0$ (0.25)3.00(0.5)5(1)10(2)18 and $\rho = 0$.1(0.1)0.9. In this table, for example, the numerical value 0.1234 -1 means $\xi = 0.1234 \times 10^{-1}$ for corresponding values of ρ , η and $F(\xi | \eta)$.

These tables are useful for various two-variate exponential problems in engineering practice as follows. One example is data generation using the simulation technique for two variables. In a two-variate normal distribution, the estimation of the dependent variable, y , for a given independent variable, x , is made by the following well-known equation.

$$y = \bar{y} + \rho \frac{\sigma_y}{\sigma_x} (x - \bar{x}) + \sigma_y \sqrt{1 - \rho^2} t \quad (36)$$

where t is a standardized normal variable with zero mean and unit standard deviation. Since the conditional variance $D^2(y|x)$ is independent of x in the case of a normal distribution, the term to be added to the conditional mean is written by the simple form as shown in the third term of the right hand in

Eq. (36). The other hand, in the case of a two-variate exponential distribution, the corresponding equation becomes the following.

$$y = \bar{y} + \rho \frac{\sigma_y}{\sigma_x} (x - \bar{x}) + \sqrt{\sigma_y^2(1-\rho)^2 + 2 \frac{\sigma_y^2}{\sigma_x} \rho(1-\rho)x} \epsilon \quad (37)$$

where ϵ is the variable corresponding to t in Eq. (36). However, ϵ is not already independent of ρ and x , but a function of $F(y|x)$, i. e. $\epsilon = \epsilon[F(y|x)]$, because the

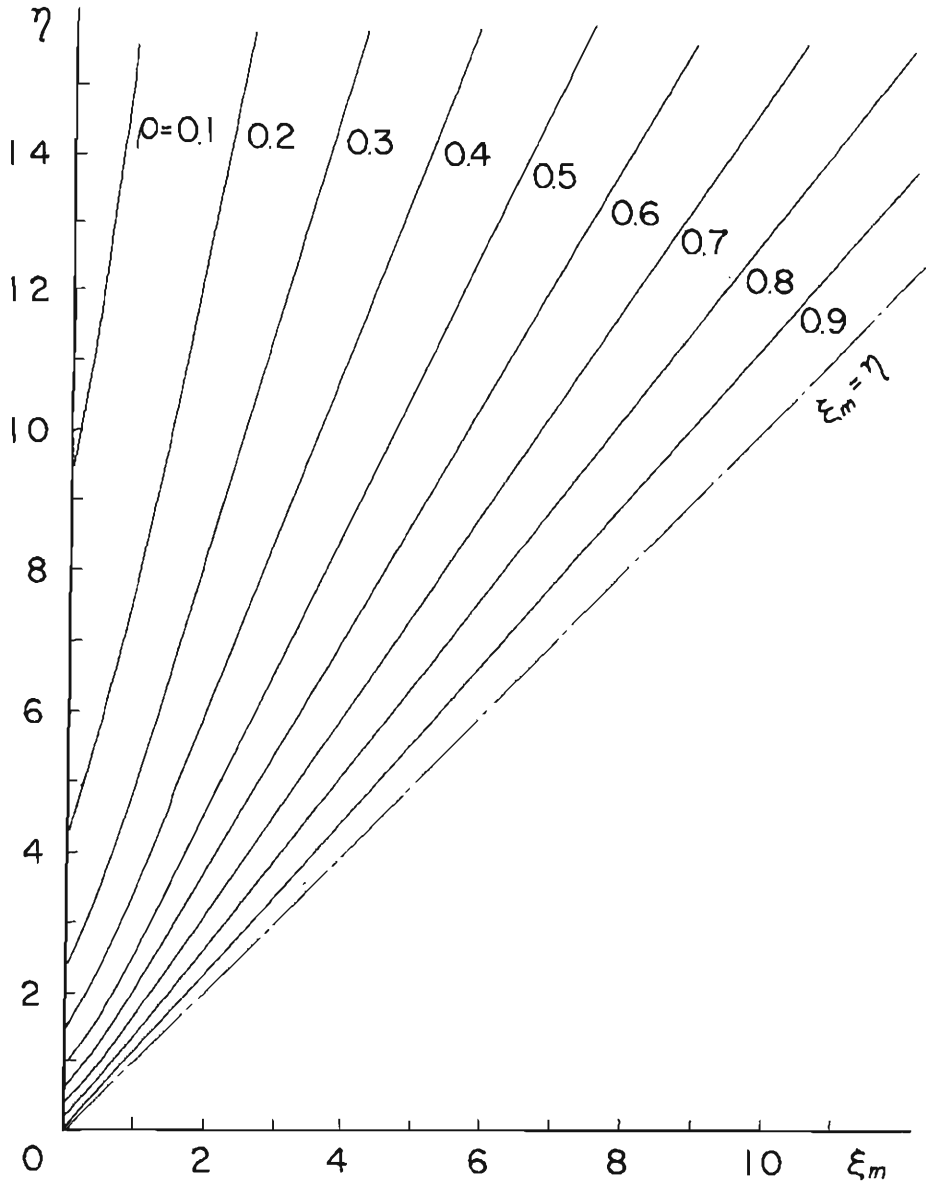


Fig. 4. Positions of mode of a conditional probability density function.

variance $D^2(y|x)$ depends on ρ and x .

That is to say, since the conditional distribution function of y in the case of a two-variate exponential distribution is dependent directly on ρ and x , y must be given by the following form.

$$y = y(F(y|x)) = y(F(\xi|\eta)). \tag{38}$$

This explanation may be supposed easily from Fig. 5. Tables 1-9 may help to deal with such problems.

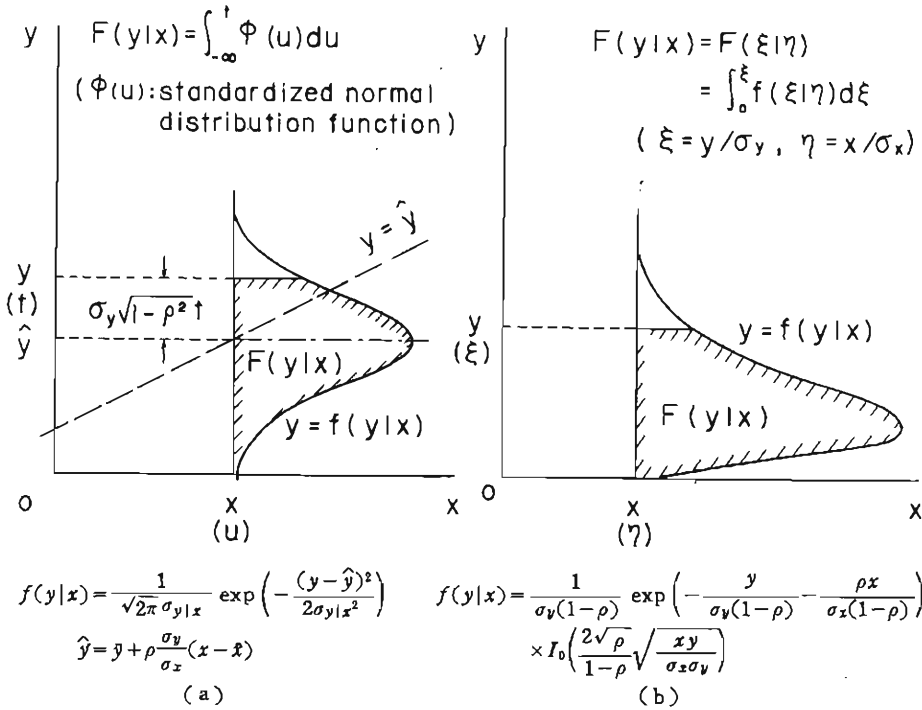


Fig. 5. Conceptual illustrations of conditional probability density functions for normal and exponential distributions.

Another example is the computation of probability in an arbitrary domain D in an x - y plane. If the domain D is expressed by the pairs of standardized variables, (ξ, η) , the probability, $P(D)$, for which a pair of variables, (ξ, η) , is included in the domain D , is given by

$$P(D) = \iint_D f(\xi, \eta) d\xi d\eta = \int_{\eta_l}^{\eta_u} f(\eta) \left\{ \int_{\xi_{il}}^{\xi_{iu}} f(\xi|\eta) d\xi \right\} d\eta$$

where η_l and η_u denote the lower and upper boundaries of η , respectively, ξ_{il} and ξ_{iu} the lower and upper boundaries of i -th strip respectively, when the domain D is subdivided into small strips of equal width by the straight lines parallel to the ξ axis. In practice, the equation is rewritten by

$$P(D) = \sum_{i=0}^n e^{-\eta_i} \{F(\xi_{iu}|\eta_i) - F(\xi_{il}|\eta_i)\} \Delta\eta_i \tag{39}$$

where $\Delta\eta_i$ and n are the width and the total number of the subdivided strips.

This computation can be easily carried on by using this table, too.

4. Conclusion

This paper has described the fundamental theory and its application of two-variate gamma distribution which has the same shape parameters, especially two-variate exponential distribution. In addition, a useful numerical table is presented for a conditional probability function. Of course, there remain other important problems to be elucidated, and we are now studying the following ones.

(1) To expand the above results to two-variate gamma distribution which has different shape parameters and also to two-variate extremal distribution.

(2) To clarify the degree of confidence of the estimated parameters and to develop the theory of testing hypothesis for two-variate gamma distribution.

(3) To apply these theoretical and numerical results to practical engineering problems such as the various river works.

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Table 1 ~ 9.

Values of ξ for $F(\xi|\eta)$ and η .

$$\begin{aligned}
 F(\xi|\eta) &= \int_0^\xi f(\xi|\eta) d\xi \\
 &= \frac{1}{1-\rho} \exp\left(-\frac{\rho\eta}{1-\rho}\right) \int_0^\xi \exp\left(-\frac{\xi}{1-\rho}\right) I_0\left(\frac{2\sqrt{\rho}}{1-\rho} \sqrt{\xi\eta}\right) d\xi
 \end{aligned}$$

Note : In the Table, 0.1234—2 means 0.1234×10^{-2}

ERRATA

PAGE	F($\xi \eta$)	η	ERROR	CORRECTION
202	0.001	0.00	0.7004 -3	0.7007 -3
204	0.001	0.00	0.6003 -3	0.6006 -3
206	0.001	0.00	0.5003 -3	0.5005 -3
208	0.001	0.00	0.4002 -3	0.4004 -3
212	0.008	1.25	0.1070 -1	0.1070 -0
212	0.11	0.75	0.2204 -0	0.2240 -0
212	0.13	0.75	0.2552 -0	0.2522 -0
212	0.45	1.25	0.1022 -0	0.1022 +1

Table 1. $\rho = 0.1$.

$F(\xi 17)/N$	0.00	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
0.001	0.003	0.029	0.058	0.087	0.106	0.101	0.104	0.109	0.115	0.118	0.119	0.122	0.127
0.002	0.002	0.017	0.034	0.051	0.065	0.062	0.064	0.068	0.072	0.074	0.075	0.077	0.080
0.003	0.002	0.012	0.023	0.035	0.045	0.042	0.043	0.046	0.049	0.051	0.052	0.054	0.056
0.004	0.002	0.009	0.017	0.025	0.032	0.029	0.030	0.032	0.034	0.035	0.036	0.037	0.039
0.005	0.003	0.008	0.014	0.020	0.026	0.023	0.024	0.025	0.027	0.028	0.029	0.030	0.031
0.006	0.004	0.007	0.012	0.017	0.022	0.019	0.020	0.021	0.023	0.024	0.025	0.026	0.027
0.007	0.005	0.006	0.010	0.014	0.018	0.015	0.016	0.017	0.019	0.020	0.021	0.022	0.023
0.008	0.006	0.006	0.009	0.013	0.017	0.014	0.015	0.016	0.018	0.019	0.020	0.021	0.022
0.009	0.007	0.007	0.010	0.014	0.018	0.015	0.016	0.017	0.019	0.020	0.021	0.022	0.023
0.010	0.008	0.008	0.011	0.015	0.019	0.016	0.017	0.018	0.020	0.021	0.022	0.023	0.024
0.011	0.009	0.009	0.012	0.016	0.020	0.017	0.018	0.019	0.021	0.022	0.023	0.024	0.025
0.012	0.010	0.010	0.013	0.017	0.021	0.018	0.019	0.020	0.022	0.023	0.024	0.025	0.026
0.013	0.011	0.011	0.014	0.018	0.022	0.019	0.020	0.021	0.023	0.024	0.025	0.026	0.027
0.014	0.012	0.012	0.015	0.019	0.023	0.020	0.021	0.022	0.024	0.025	0.026	0.027	0.028
0.015	0.013	0.013	0.016	0.020	0.024	0.021	0.022	0.023	0.025	0.026	0.027	0.028	0.029
0.016	0.014	0.014	0.017	0.021	0.025	0.022	0.023	0.024	0.026	0.027	0.028	0.029	0.030
0.017	0.015	0.015	0.018	0.022	0.026	0.023	0.024	0.025	0.027	0.028	0.029	0.030	0.031
0.018	0.016	0.016	0.019	0.023	0.027	0.024	0.025	0.026	0.028	0.029	0.030	0.031	0.032
0.019	0.017	0.017	0.020	0.024	0.028	0.025	0.026	0.027	0.029	0.030	0.031	0.032	0.033
0.020	0.018	0.018	0.021	0.025	0.029	0.026	0.027	0.028	0.030	0.031	0.032	0.033	0.034
0.021	0.019	0.019	0.022	0.026	0.030	0.027	0.028	0.029	0.031	0.032	0.033	0.034	0.035
0.022	0.020	0.020	0.023	0.027	0.031	0.028	0.029	0.030	0.032	0.033	0.034	0.035	0.036
0.023	0.021	0.021	0.024	0.028	0.032	0.029	0.030	0.031	0.033	0.034	0.035	0.036	0.037
0.024	0.022	0.022	0.025	0.029	0.033	0.030	0.031	0.032	0.034	0.035	0.036	0.037	0.038
0.025	0.023	0.023	0.026	0.030	0.034	0.031	0.032	0.033	0.035	0.036	0.037	0.038	0.039
0.026	0.024	0.024	0.027	0.031	0.035	0.032	0.033	0.034	0.036	0.037	0.038	0.039	0.040
0.027	0.025	0.025	0.028	0.032	0.036	0.033	0.034	0.035	0.037	0.038	0.039	0.040	0.041
0.028	0.026	0.026	0.029	0.033	0.037	0.034	0.035	0.036	0.038	0.039	0.040	0.041	0.042
0.029	0.027	0.027	0.030	0.034	0.038	0.035	0.036	0.037	0.039	0.040	0.041	0.042	0.043
0.030	0.028	0.028	0.031	0.035	0.039	0.036	0.037	0.038	0.040	0.041	0.042	0.043	0.044
0.031	0.029	0.029	0.032	0.036	0.040	0.037	0.038	0.039	0.041	0.042	0.043	0.044	0.045
0.032	0.030	0.030	0.033	0.037	0.041	0.038	0.039	0.040	0.042	0.043	0.044	0.045	0.046
0.033	0.031	0.031	0.034	0.038	0.042	0.039	0.040	0.041	0.043	0.044	0.045	0.046	0.047
0.034	0.032	0.032	0.035	0.039	0.043	0.040	0.041	0.042	0.044	0.045	0.046	0.047	0.048
0.035	0.033	0.033	0.036	0.040	0.044	0.041	0.042	0.043	0.045	0.046	0.047	0.048	0.049
0.036	0.034	0.034	0.037	0.041	0.045	0.042	0.043	0.044	0.046	0.047	0.048	0.049	0.050
0.037	0.035	0.035	0.038	0.042	0.046	0.043	0.044	0.045	0.047	0.048	0.049	0.050	0.051
0.038	0.036	0.036	0.039	0.043	0.047	0.044	0.045	0.046	0.048	0.049	0.050	0.051	0.052
0.039	0.037	0.037	0.040	0.044	0.048	0.045	0.046	0.047	0.049	0.050	0.051	0.052	0.053
0.040	0.038	0.038	0.041	0.045	0.049	0.046	0.047	0.048	0.050	0.051	0.052	0.053	0.054
0.041	0.039	0.039	0.042	0.046	0.050	0.047	0.048	0.049	0.051	0.052	0.053	0.054	0.055
0.042	0.040	0.040	0.043	0.047	0.051	0.048	0.049	0.050	0.052	0.053	0.054	0.055	0.056
0.043	0.041	0.041	0.044	0.048	0.052	0.049	0.050	0.051	0.053	0.054	0.055	0.056	0.057
0.044	0.042	0.042	0.045	0.049	0.053	0.050	0.051	0.052	0.054	0.055	0.056	0.057	0.058
0.045	0.043	0.043	0.046	0.050	0.054	0.051	0.052	0.053	0.055	0.056	0.057	0.058	0.059
0.046	0.044	0.044	0.047	0.051	0.055	0.052	0.053	0.054	0.056	0.057	0.058	0.059	0.060
0.047	0.045	0.045	0.048	0.052	0.056	0.053	0.054	0.055	0.057	0.058	0.059	0.060	0.061
0.048	0.046	0.046	0.049	0.053	0.057	0.054	0.055	0.056	0.058	0.059	0.060	0.061	0.062
0.049	0.047	0.047	0.050	0.054	0.058	0.055	0.056	0.057	0.059	0.060	0.061	0.062	0.063
0.050	0.048	0.048	0.051	0.055	0.059	0.056	0.057	0.058	0.060	0.061	0.062	0.063	0.064
0.051	0.049	0.049	0.052	0.056	0.060	0.057	0.058	0.059	0.061	0.062	0.063	0.064	0.065
0.052	0.050	0.050	0.053	0.057	0.061	0.058	0.059	0.060	0.062	0.063	0.064	0.065	0.066
0.053	0.051	0.051	0.054	0.058	0.062	0.059	0.060	0.061	0.063	0.064	0.065	0.066	0.067
0.054	0.052	0.052	0.055	0.059	0.063	0.060	0.061	0.062	0.064	0.065	0.066	0.067	0.068
0.055	0.053	0.053	0.056	0.060	0.064	0.061	0.062	0.063	0.065	0.066	0.067	0.068	0.069
0.056	0.054	0.054	0.057	0.061	0.065	0.062	0.063	0.064	0.066	0.067	0.068	0.069	0.070
0.057	0.055	0.055	0.058	0.062	0.066	0.063	0.064	0.065	0.067	0.068	0.069	0.070	0.071
0.058	0.056	0.056	0.059	0.063	0.067	0.064	0.065	0.066	0.068	0.069	0.070	0.071	0.072
0.059	0.057	0.057	0.060	0.064	0.068	0.065	0.066	0.067	0.069	0.070	0.071	0.072	0.073
0.060	0.058	0.058	0.061	0.065	0.069	0.066	0.067	0.068	0.070	0.071	0.072	0.073	0.074
0.061	0.059	0.059	0.062	0.066	0.070	0.067	0.068	0.069	0.071	0.072	0.073	0.074	0.075
0.062	0.060	0.060	0.063	0.067	0.071	0.068	0.069	0.070	0.072	0.073	0.074	0.075	0.076
0.063	0.061	0.061	0.064	0.068	0.072	0.069	0.070	0.071	0.073	0.074	0.075	0.076	0.077
0.064	0.062	0.062	0.065	0.069	0.073	0.070	0.071	0.072	0.074	0.075	0.076	0.077	0.078
0.065	0.063	0.063	0.066	0.070	0.074	0.071	0.072	0.073	0.075	0.076	0.077	0.078	0.079
0.066	0.064	0.064	0.067	0.071	0.075	0.072	0.073	0.074	0.076	0.077	0.078	0.079	0.080
0.067	0.065	0.065	0.068	0.072	0.076	0.073	0.074	0.075	0.077	0.078	0.079	0.080	0.081
0.068	0.066	0.066	0.069	0.073	0.077	0.074	0.075	0.076	0.078	0.079	0.080	0.081	0.082
0.069	0.067	0.067	0.070	0.074	0.078	0.075	0.076	0.077	0.079	0.080	0.081	0.082	0.083
0.070	0.068	0.068	0.071	0.075	0.079	0.076	0.077	0.078	0.080	0.081	0.082	0.083	0.084
0.071	0.069	0.069	0.072	0.076	0.080	0.077	0.078	0.079	0.081	0.082	0.083	0.084	0.085
0.072	0.070	0.070	0.073	0.077	0.081	0.078	0.079	0.080	0.082	0.083	0.084	0.085	0.086
0.073	0.071	0.071	0.074	0.078	0.082	0.079	0.080	0.081	0.083	0.084	0.085	0.086	0.087
0.074	0.072	0.072	0.075	0.079	0.083	0.080	0.081	0.082	0.084	0.085	0.086	0.087	0.088
0.075	0.073	0.073	0.076	0.080	0.084	0.081	0.082	0.083	0.085	0.086	0.087	0.088	0.089
0.076	0.074	0.074	0.077	0.081	0.085	0.082	0.083	0.084	0.086	0.087	0.088	0.089	0.090
0.077	0.075	0.075	0.078	0.082	0.086	0.083	0.084	0.085	0.087	0.088	0.089	0.090	0.091
0.078	0.076	0.076	0.079	0.083	0.087	0.084	0.085	0.086	0.088	0.089	0.090	0.091	0.092
0.079	0.077	0.077	0.080	0.084	0.088	0.085	0.086	0.087	0.089	0.090	0.091	0.092	0.093
0.080	0.078	0.078	0.081	0.085	0.089	0.086	0.087	0.088	0.090	0.091	0.092	0.093	0.094
0.081	0.079	0.079	0.082	0.086	0.090	0.087	0.088	0.089	0.091	0.092	0.093	0.094	0.095
0.082	0.080	0.080	0.083	0.087	0.091	0.088	0.089	0.090	0.092	0.093	0.094	0.095	0.096
0.083	0.081	0.081	0.084	0.088	0.092	0.089	0.090	0.091	0.093	0.094	0.095	0.096	0.097
0.0													

Table 1. (Continued) $\rho=0.1$.

$F(x, y)$	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	12.0	14.0	16.0	18.0
0.001	0.1728	0.1604	0.1484	0.1369	0.1259	0.1154	0.1054	0.0959	0.0869	0.0784	0.0704	0.0629	0.0558
0.002	0.1732	0.1607	0.1487	0.1372	0.1262	0.1157	0.1057	0.0962	0.0872	0.0787	0.0707	0.0632	0.0561
0.003	0.1736	0.1611	0.1491	0.1376	0.1266	0.1161	0.1061	0.0966	0.0876	0.0791	0.0711	0.0636	0.0565
0.004	0.1740	0.1615	0.1495	0.1380	0.1270	0.1165	0.1065	0.0970	0.0880	0.0795	0.0715	0.0640	0.0569
0.005	0.1744	0.1619	0.1499	0.1384	0.1274	0.1169	0.1069	0.0974	0.0884	0.0799	0.0719	0.0644	0.0573
0.006	0.1748	0.1623	0.1503	0.1388	0.1278	0.1173	0.1073	0.0978	0.0888	0.0803	0.0723	0.0648	0.0577
0.007	0.1752	0.1627	0.1507	0.1392	0.1282	0.1177	0.1077	0.0982	0.0892	0.0807	0.0727	0.0652	0.0581
0.008	0.1756	0.1631	0.1511	0.1396	0.1286	0.1181	0.1081	0.0986	0.0896	0.0811	0.0731	0.0656	0.0585
0.009	0.1760	0.1635	0.1515	0.1400	0.1290	0.1185	0.1085	0.0990	0.0900	0.0815	0.0735	0.0660	0.0589
0.010	0.1764	0.1639	0.1519	0.1404	0.1294	0.1189	0.1089	0.0994	0.0904	0.0819	0.0739	0.0664	0.0593
0.011	0.1768	0.1643	0.1523	0.1408	0.1298	0.1193	0.1093	0.0998	0.0908	0.0823	0.0743	0.0668	0.0597
0.012	0.1772	0.1647	0.1527	0.1412	0.1302	0.1197	0.1097	0.1002	0.0912	0.0827	0.0747	0.0672	0.0601
0.013	0.1776	0.1651	0.1531	0.1416	0.1306	0.1201	0.1101	0.1006	0.0916	0.0831	0.0751	0.0676	0.0605
0.014	0.1780	0.1655	0.1535	0.1420	0.1310	0.1205	0.1105	0.1010	0.0920	0.0835	0.0755	0.0680	0.0609
0.015	0.1784	0.1659	0.1539	0.1424	0.1314	0.1209	0.1109	0.1014	0.0924	0.0839	0.0759	0.0684	0.0613
0.016	0.1788	0.1663	0.1543	0.1428	0.1318	0.1213	0.1113	0.1018	0.0928	0.0843	0.0763	0.0688	0.0617
0.017	0.1792	0.1667	0.1547	0.1432	0.1322	0.1217	0.1117	0.1022	0.0932	0.0847	0.0767	0.0692	0.0621
0.018	0.1796	0.1671	0.1551	0.1436	0.1326	0.1221	0.1121	0.1026	0.0936	0.0851	0.0771	0.0696	0.0625
0.019	0.1800	0.1675	0.1555	0.1440	0.1330	0.1225	0.1125	0.1030	0.0940	0.0855	0.0775	0.0700	0.0629
0.020	0.1804	0.1679	0.1559	0.1444	0.1334	0.1229	0.1129	0.1034	0.0944	0.0859	0.0779	0.0704	0.0633
0.021	0.1808	0.1683	0.1563	0.1448	0.1338	0.1233	0.1133	0.1038	0.0948	0.0863	0.0783	0.0708	0.0637
0.022	0.1812	0.1687	0.1567	0.1452	0.1342	0.1237	0.1137	0.1042	0.0952	0.0867	0.0787	0.0712	0.0641
0.023	0.1816	0.1691	0.1571	0.1456	0.1346	0.1241	0.1141	0.1046	0.0956	0.0871	0.0791	0.0716	0.0645
0.024	0.1820	0.1695	0.1575	0.1460	0.1350	0.1245	0.1145	0.1050	0.0960	0.0875	0.0795	0.0720	0.0649
0.025	0.1824	0.1699	0.1579	0.1464	0.1354	0.1249	0.1149	0.1054	0.0964	0.0879	0.0799	0.0724	0.0653
0.026	0.1828	0.1703	0.1583	0.1468	0.1358	0.1253	0.1153	0.1058	0.0968	0.0883	0.0803	0.0728	0.0657
0.027	0.1832	0.1707	0.1587	0.1472	0.1362	0.1257	0.1157	0.1062	0.0972	0.0887	0.0807	0.0732	0.0661
0.028	0.1836	0.1711	0.1591	0.1476	0.1366	0.1261	0.1161	0.1066	0.0976	0.0891	0.0811	0.0736	0.0665
0.029	0.1840	0.1715	0.1595	0.1480	0.1370	0.1265	0.1165	0.1070	0.0980	0.0895	0.0815	0.0740	0.0669
0.030	0.1844	0.1719	0.1599	0.1484	0.1374	0.1269	0.1169	0.1074	0.0984	0.0899	0.0819	0.0744	0.0673
0.031	0.1848	0.1723	0.1603	0.1488	0.1378	0.1273	0.1173	0.1078	0.0988	0.0903	0.0823	0.0748	0.0677
0.032	0.1852	0.1727	0.1607	0.1492	0.1382	0.1277	0.1177	0.1082	0.0992	0.0907	0.0827	0.0752	0.0681
0.033	0.1856	0.1731	0.1611	0.1496	0.1386	0.1281	0.1181	0.1086	0.0996	0.0911	0.0831	0.0756	0.0685
0.034	0.1860	0.1735	0.1615	0.1500	0.1390	0.1285	0.1185	0.1090	0.1000	0.0915	0.0835	0.0760	0.0689
0.035	0.1864	0.1739	0.1619	0.1504	0.1394	0.1289	0.1189	0.1094	0.1004	0.0919	0.0839	0.0764	0.0693
0.036	0.1868	0.1743	0.1623	0.1508	0.1398	0.1293	0.1193	0.1098	0.1008	0.0923	0.0843	0.0768	0.0697
0.037	0.1872	0.1747	0.1627	0.1512	0.1402	0.1297	0.1197	0.1102	0.1012	0.0927	0.0847	0.0772	0.0701
0.038	0.1876	0.1751	0.1631	0.1516	0.1406	0.1301	0.1201	0.1106	0.1016	0.0931	0.0851	0.0776	0.0705
0.039	0.1880	0.1755	0.1635	0.1520	0.1410	0.1305	0.1205	0.1110	0.1020	0.0935	0.0855	0.0780	0.0709
0.040	0.1884	0.1759	0.1639	0.1524	0.1414	0.1309	0.1209	0.1114	0.1024	0.0939	0.0859	0.0784	0.0713
0.041	0.1888	0.1763	0.1643	0.1528	0.1418	0.1313	0.1213	0.1118	0.1028	0.0943	0.0863	0.0788	0.0717
0.042	0.1892	0.1767	0.1647	0.1532	0.1422	0.1317	0.1217	0.1122	0.1032	0.0947	0.0867	0.0792	0.0721
0.043	0.1896	0.1771	0.1651	0.1536	0.1426	0.1321	0.1221	0.1126	0.1036	0.0951	0.0871	0.0796	0.0725
0.044	0.1900	0.1775	0.1655	0.1540	0.1430	0.1325	0.1225	0.1130	0.1040	0.0955	0.0875	0.0800	0.0729
0.045	0.1904	0.1779	0.1659	0.1544	0.1434	0.1329	0.1229	0.1134	0.1044	0.0959	0.0879	0.0804	0.0733
0.046	0.1908	0.1783	0.1663	0.1548	0.1438	0.1333	0.1233	0.1138	0.1048	0.0963	0.0883	0.0808	0.0737
0.047	0.1912	0.1787	0.1667	0.1552	0.1442	0.1337	0.1237	0.1142	0.1052	0.0967	0.0887	0.0812	0.0741
0.048	0.1916	0.1791	0.1671	0.1556	0.1446	0.1341	0.1241	0.1146	0.1056	0.0971	0.0891	0.0816	0.0745
0.049	0.1920	0.1795	0.1675	0.1560	0.1450	0.1345	0.1245	0.1150	0.1060	0.0975	0.0895	0.0820	0.0749
0.050	0.1924	0.1799	0.1679	0.1564	0.1454	0.1349	0.1249	0.1154	0.1064	0.0979	0.0899	0.0824	0.0753
0.051	0.1928	0.1803	0.1683	0.1568	0.1458	0.1353	0.1253	0.1158	0.1068	0.0983	0.0903	0.0828	0.0757
0.052	0.1932	0.1807	0.1687	0.1572	0.1462	0.1357	0.1257	0.1162	0.1072	0.0987	0.0907	0.0832	0.0761
0.053	0.1936	0.1811	0.1691	0.1576	0.1466	0.1361	0.1261	0.1166	0.1076	0.0991	0.0911	0.0836	0.0765
0.054	0.1940	0.1815	0.1695	0.1580	0.1470	0.1365	0.1265	0.1170	0.1080	0.0995	0.0915	0.0840	0.0769
0.055	0.1944	0.1819	0.1699	0.1584	0.1474	0.1369	0.1269	0.1174	0.1084	0.0999	0.0919	0.0844	0.0773
0.056	0.1948	0.1823	0.1703	0.1588	0.1478	0.1373	0.1273	0.1178	0.1088	0.1003	0.0923	0.0848	0.0777
0.057	0.1952	0.1827	0.1707	0.1592	0.1482	0.1377	0.1277	0.1182	0.1092	0.1007	0.0927	0.0852	0.0781
0.058	0.1956	0.1831	0.1711	0.1596	0.1486	0.1381	0.1281	0.1186	0.1096	0.1011	0.0931	0.0856	0.0785
0.059	0.1960	0.1835	0.1715	0.1600	0.1490	0.1385	0.1285	0.1190	0.1100	0.1015	0.0935	0.0860	0.0789
0.060	0.1964	0.1839	0.1719	0.1604	0.1494	0.1389	0.1289	0.1194	0.1104	0.1019	0.0939	0.0864	0.0793
0.061	0.1968	0.1843	0.1723	0.1608	0.1498	0.1393	0.1293	0.1198	0.1108	0.1023	0.0943	0.0868	0.0797
0.062	0.1972	0.1847	0.1727	0.1612	0.1502	0.1397	0.1297	0.1202	0.1112	0.1027	0.0947	0.0872	0.0801
0.063	0.1976	0.1851	0.1731	0.1616	0.1506	0.1401	0.1301	0.1206	0.1116	0.1031	0.0951	0.0876	0.0805
0.064	0.1980	0.1855	0.1735	0.1620	0.1510	0.1405	0.1305	0.1210	0.1120	0.1035	0.0955	0.0880	0.0809
0.065	0.1984	0.1859	0.1739	0.1624	0.1514	0.1409	0.1309	0.1214	0.1124	0.1039	0.0959	0.0884	0.0813
0.066	0.1988	0.1863	0.1743	0.1628	0.1518	0.1413	0.1313	0.1218	0.1128	0.1043	0.0963	0.0888	0.0817
0.067	0.1992	0.1867	0.1747	0.1632	0.1522	0.1417	0.1317	0.1222	0.1132	0.1047	0.0967	0.0892	0.0821
0.068	0.1996	0.1871	0.1751	0.1636	0.1526	0.1421	0.1321	0.1226	0.1136	0.1051	0.0971	0.0896	0.0825
0.069	0.2000	0.1875	0.1755	0.1640	0.1530	0.1425	0.1325	0.1230	0.1140	0.1055	0.0975	0.0900	0.0829
0.070	0.2004	0.1879	0.1759	0.1644	0.1534	0.1429	0.1329	0.1234	0.1144	0.1059	0.0979	0.0904	0.0833
0.071	0.2008	0.1883	0.1763	0.1648	0.1538	0.1433	0.1333	0.1238	0.1148	0.1063	0.0983	0.0908	0.0837
0.072	0.2012	0.1887	0.1767	0.1652	0.1542	0.1437	0.1337	0.1242	0.1152	0.1067	0.0987	0.0912	0.0841
0.073	0.2016	0.1891	0.1771	0.1656	0.1546	0.1441	0.1341	0.1246	0.1156	0.1071	0.0991	0.0916	0.0845
0.074	0.2020	0.1895	0.1775	0.1660	0.1550	0.1445	0.1345	0.1250	0.1160	0.1075	0.0995	0.0920	0.0849
0.075	0.2024	0.1899	0.1779	0.1664	0.1554	0.1449	0.1349	0.1254	0.1164	0.1079	0.0999	0.0924	0.0853
0.076	0.2028	0.1903	0.1783	0.1668	0.1558	0.1453	0.1353	0.1258	0.1168	0.1083	0.1003	0.0928	0.0857
0.077	0.2032	0.1907	0.1787										

Table 2. (Continued) $\rho = 0.2$.

$F(x, y)$	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	
0.001	0.1815	0.2137	0.2464	0.2791	0.3118	0.3445	0.3772	0.4099	0.4426	0.4753	0.5080	0.5407	0.5734	0.6061	0.6388	0.6715	0.7042	0.7369	0.7696	0.8023	0.8350	0.8677	0.9004
0.002	0.1820	0.2142	0.2469	0.2796	0.3123	0.3450	0.3777	0.4104	0.4431	0.4758	0.5085	0.5412	0.5739	0.6066	0.6393	0.6720	0.7047	0.7374	0.7701	0.8028	0.8355	0.8682	0.9009
0.003	0.1825	0.2147	0.2474	0.2801	0.3128	0.3455	0.3782	0.4109	0.4436	0.4763	0.5090	0.5417	0.5744	0.6071	0.6398	0.6725	0.7052	0.7379	0.7706	0.8033	0.8360	0.8687	0.9014
0.004	0.1830	0.2152	0.2479	0.2806	0.3133	0.3460	0.3787	0.4114	0.4441	0.4768	0.5095	0.5422	0.5749	0.6076	0.6403	0.6730	0.7057	0.7384	0.7711	0.8038	0.8365	0.8692	0.9019
0.005	0.1835	0.2157	0.2484	0.2811	0.3138	0.3465	0.3792	0.4119	0.4446	0.4773	0.5100	0.5427	0.5754	0.6081	0.6408	0.6735	0.7062	0.7389	0.7716	0.8043	0.8370	0.8697	0.9024
0.006	0.1840	0.2162	0.2489	0.2816	0.3143	0.3470	0.3797	0.4124	0.4451	0.4778	0.5105	0.5432	0.5759	0.6086	0.6413	0.6740	0.7067	0.7394	0.7721	0.8048	0.8375	0.8702	0.9029
0.007	0.1845	0.2167	0.2494	0.2821	0.3148	0.3475	0.3802	0.4129	0.4456	0.4783	0.5110	0.5437	0.5764	0.6091	0.6418	0.6745	0.7072	0.7399	0.7726	0.8053	0.8380	0.8707	0.9034
0.008	0.1850	0.2172	0.2500	0.2826	0.3153	0.3480	0.3807	0.4134	0.4461	0.4788	0.5115	0.5442	0.5769	0.6096	0.6423	0.6750	0.7077	0.7404	0.7731	0.8058	0.8385	0.8712	0.9039
0.009	0.1855	0.2177	0.2505	0.2831	0.3158	0.3485	0.3812	0.4139	0.4466	0.4793	0.5120	0.5447	0.5774	0.6101	0.6428	0.6755	0.7082	0.7409	0.7736	0.8063	0.8390	0.8717	0.9044
0.010	0.1860	0.2182	0.2510	0.2836	0.3163	0.3490	0.3817	0.4144	0.4471	0.4800	0.5125	0.5450	0.5777	0.6104	0.6431	0.6758	0.7085	0.7412	0.7739	0.8066	0.8393	0.8720	0.9049
0.011	0.1865	0.2187	0.2515	0.2841	0.3168	0.3495	0.3822	0.4149	0.4476	0.4805	0.5130	0.5455	0.5782	0.6109	0.6436	0.6763	0.7090	0.7417	0.7744	0.8071	0.8398	0.8725	0.9054
0.012	0.1870	0.2192	0.2520	0.2846	0.3173	0.3500	0.3827	0.4154	0.4481	0.4810	0.5135	0.5460	0.5787	0.6114	0.6439	0.6766	0.7093	0.7420	0.7747	0.8074	0.8401	0.8728	0.9059
0.013	0.1875	0.2197	0.2525	0.2851	0.3178	0.3505	0.3832	0.4159	0.4486	0.4815	0.5140	0.5465	0.5792	0.6117	0.6442	0.6769	0.7096	0.7423	0.7750	0.8077	0.8404	0.8731	0.9064
0.014	0.1880	0.2202	0.2530	0.2856	0.3183	0.3510	0.3837	0.4164	0.4491	0.4820	0.5145	0.5470	0.5797	0.6122	0.6447	0.6774	0.7101	0.7428	0.7755	0.8082	0.8409	0.8736	0.9069
0.015	0.1885	0.2207	0.2535	0.2861	0.3188	0.3515	0.3842	0.4169	0.4496	0.4825	0.5150	0.5475	0.5802	0.6127	0.6452	0.6779	0.7106	0.7433	0.7760	0.8087	0.8414	0.8741	0.9074
0.016	0.1890	0.2212	0.2540	0.2866	0.3193	0.3520	0.3847	0.4174	0.4501	0.4830	0.5155	0.5480	0.5807	0.6132	0.6457	0.6784	0.7111	0.7438	0.7765	0.8092	0.8419	0.8746	0.9079
0.017	0.1895	0.2217	0.2545	0.2871	0.3198	0.3525	0.3852	0.4179	0.4506	0.4835	0.5160	0.5485	0.5812	0.6137	0.6462	0.6789	0.7116	0.7443	0.7770	0.8097	0.8424	0.8751	0.9084
0.018	0.1900	0.2222	0.2550	0.2876	0.3203	0.3530	0.3857	0.4184	0.4511	0.4840	0.5165	0.5490	0.5817	0.6142	0.6467	0.6794	0.7121	0.7448	0.7775	0.8102	0.8429	0.8756	0.9089
0.019	0.1905	0.2227	0.2555	0.2881	0.3208	0.3535	0.3862	0.4189	0.4516	0.4845	0.5170	0.5495	0.5822	0.6147	0.6472	0.6801	0.7128	0.7455	0.7782	0.8109	0.8434	0.8761	0.9094
0.020	0.1910	0.2232	0.2560	0.2886	0.3213	0.3540	0.3867	0.4194	0.4521	0.4850	0.5175	0.5500	0.5827	0.6152	0.6477	0.6806	0.7133	0.7460	0.7787	0.8114	0.8441	0.8766	0.9099
0.021	0.1915	0.2237	0.2565	0.2891	0.3218	0.3545	0.3872	0.4200	0.4526	0.4855	0.5180	0.5505	0.5832	0.6157	0.6482	0.6811	0.7138	0.7465	0.7792	0.8119	0.8446	0.8773	0.9104
0.022	0.1920	0.2242	0.2570	0.2896	0.3223	0.3550	0.3877	0.4205	0.4531	0.4860	0.5185	0.5510	0.5837	0.6162	0.6487	0.6816	0.7143	0.7470	0.7797	0.8124	0.8451	0.8778	0.9109
0.023	0.1925	0.2247	0.2575	0.2901	0.3228	0.3555	0.3882	0.4210	0.4536	0.4865	0.5190	0.5515	0.5842	0.6167	0.6492	0.6821	0.7148	0.7475	0.7802	0.8129	0.8456	0.8783	0.9114
0.024	0.1930	0.2252	0.2580	0.2906	0.3233	0.3560	0.3887	0.4215	0.4541	0.4870	0.5195	0.5520	0.5847	0.6172	0.6497	0.6826	0.7153	0.7480	0.7807	0.8134	0.8461	0.8788	0.9119
0.025	0.1935	0.2257	0.2585	0.2911	0.3238	0.3565	0.3892	0.4220	0.4546	0.4875	0.5200	0.5525	0.5852	0.6177	0.6502	0.6831	0.7158	0.7485	0.7812	0.8139	0.8466	0.8793	0.9124
0.026	0.1940	0.2262	0.2590	0.2916	0.3243	0.3570	0.3897	0.4225	0.4551	0.4880	0.5205	0.5530	0.5857	0.6182	0.6507	0.6836	0.7163	0.7490	0.7817	0.8144	0.8471	0.8798	0.9129
0.027	0.1945	0.2267	0.2595	0.2921	0.3248	0.3575	0.3902	0.4230	0.4556	0.4885	0.5210	0.5535	0.5862	0.6187	0.6512	0.6841	0.7168	0.7495	0.7822	0.8149	0.8476	0.8803	0.9134
0.028	0.1950	0.2272	0.2600	0.2926	0.3253	0.3580	0.3907	0.4235	0.4561	0.4890	0.5215	0.5540	0.5867	0.6192	0.6517	0.6846	0.7173	0.7500	0.7827	0.8154	0.8481	0.8808	0.9139
0.029	0.1955	0.2277	0.2605	0.2931	0.3258	0.3585	0.3912	0.4240	0.4566	0.4895	0.5220	0.5545	0.5872	0.6197	0.6522	0.6851	0.7178	0.7505	0.7832	0.8159	0.8486	0.8813	0.9144
0.030	0.1960	0.2282	0.2610	0.2936	0.3263	0.3590	0.3917	0.4245	0.4571	0.4900	0.5225	0.5550	0.5877	0.6202	0.6527	0.6856	0.7183	0.7510	0.7837	0.8164	0.8491	0.8818	0.9149
0.031	0.1965	0.2287	0.2615	0.2941	0.3268	0.3595	0.3922	0.4250	0.4576	0.4905	0.5230	0.5555	0.5882	0.6207	0.6532	0.6861	0.7188	0.7515	0.7842	0.8169	0.8496	0.8823	0.9154
0.032	0.1970	0.2292	0.2620	0.2946	0.3273	0.3600	0.3927	0.4255	0.4581	0.4910	0.5235	0.5560	0.5887	0.6212	0.6537	0.6866	0.7193	0.7520	0.7847	0.8174	0.8501	0.8828	0.9159
0.033	0.1975	0.2297	0.2625	0.2951	0.3278	0.3605	0.3932	0.4260	0.4586	0.4915	0.5240	0.5565	0.5892	0.6217	0.6542	0.6871	0.7200	0.7527	0.7854	0.8181	0.8508	0.8835	0.9164
0.034	0.1980	0.2302	0.2630	0.2956	0.3283	0.3610	0.3937	0.4265	0.4591	0.4920	0.5245	0.5570	0.5897	0.6222	0.6547	0.6876	0.7205	0.7532	0.7859	0.8186	0.8513	0.8840	0.9169
0.035	0.1985	0.2307	0.2635	0.2961	0.3288	0.3615	0.3942	0.4270	0.4596	0.4925	0.5250	0.5575	0.5902	0.6227	0.6552	0.6881	0.7210	0.7537	0.7864	0.8191	0.8518	0.8845	0.9174
0.036	0.1990	0.2312	0.2640	0.2966	0.3293	0.3620	0.3947	0.4275	0.4601	0.4930	0.5255	0.5580	0.5907	0.6232	0.6557	0.6886	0.7215	0.7542	0.7869	0.8196	0.8523	0.8850	0.9179
0.037	0.1995	0.2317	0.2645	0.2971	0.3298	0.3625	0.3952	0.4280	0.4606	0.4935	0.5260	0.5585	0.5912	0.6237	0.6562	0.6891	0.7220	0.7547	0.7874	0.8201	0.8528	0.8855	0.9184
0.038	0.2000	0.2322	0.2650	0.2976	0.3303	0.3630	0.3957	0.4285	0.4611	0.4940	0.5265	0.5590	0.5917	0.6242	0.6567	0.6896	0.7225	0.7552	0.7879	0.8206	0.8533	0.8860	0.9189
0.039	0.2005	0.2327	0.2655	0.2981	0.3308	0.3635	0.3962	0.4290	0.4616	0.4945	0.5270	0.5595	0.5922	0.6247	0.6572	0.6901	0.7230	0.7557	0.7884	0.8211	0.8538	0.8865	0.9194
0.040	0.2010	0.2332	0.2660	0.2986	0.3313	0.3640	0.3967	0.4295	0.4621	0.4950	0.5275	0.5600	0.5927	0.6252	0.6577	0.6906	0.7235	0.7562	0.7889	0.8216	0.8543	0.8870	0.9199
0.041	0.2015	0.2337	0.2665	0.2991	0.3318	0.3645	0.3972	0.4300	0.4626	0.4955	0.5280	0.5605	0.5932	0.6257	0.6582	0.6911	0.7240	0.7567	0.7894	0.8221	0.8548	0.8875	0.9204
0.042	0.2020	0.2342	0.2670	0.2996	0.3323	0.3650	0.3977	0.4305	0.4631	0.4960	0.5285	0.5610	0.5937	0.6262	0.6587	0.6916	0.7245	0.7572	0.7900	0.8227	0.8554	0.8881	0.9209
0.043	0.2025	0.2347	0.2675	0.3001	0.3328	0.3655	0.3982	0.4310	0.4636	0.4965	0.5290	0.5615	0.5942	0.6267	0.6592	0.6921	0.7250	0.7577	0.7905	0.8232	0.8559	0.8886	0.9214
0.044	0.2030	0.2352	0.2680	0.3006	0.3333	0.3660	0.3987	0.4315	0.4641	0.4970	0.5295	0.5620	0.5947	0.6272	0.6597	0.6926	0.7255	0.7582	0.7910	0.8237	0.8564	0.8891	0.9219
0.045	0.2035	0.2357	0.2685	0.3011	0.3338	0.3665	0.3992	0.4320	0.4646	0.4975	0.5300	0.5625	0.5952	0.6277</									

Table 3. $\rho = 0.3$.

$F(\xi \eta), \eta$	0.00	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
0.001	0.1004	-0.7706	0.6977	0.9058	0.1075	0.1197	0.1312	0.1482	0.1650	0.1836	0.2043	0.2274	0.2531
0.002	0.1401	-0.1960	0.1778	0.1937	0.2173	0.2394	0.2684	0.2915	0.3100	0.3372	0.3672	0.4047	0.4599
0.003	0.1801	0.2120	0.2372	0.2638	0.2912	0.3192	0.3478	0.3764	0.4052	0.4342	0.4632	0.4922	0.5211
0.004	0.2201	0.2520	0.2772	0.3038	0.3312	0.3592	0.3878	0.4164	0.4452	0.4742	0.5032	0.5322	0.5611
0.005	0.2601	0.2920	0.3172	0.3438	0.3712	0.3992	0.4278	0.4564	0.4852	0.5142	0.5432	0.5722	0.6011
0.006	0.3001	0.3320	0.3572	0.3838	0.4112	0.4392	0.4678	0.4964	0.5252	0.5542	0.5832	0.6122	0.6411
0.007	0.3401	0.3720	0.3972	0.4238	0.4512	0.4792	0.5078	0.5364	0.5652	0.5942	0.6232	0.6522	0.6811
0.008	0.3801	0.4120	0.4372	0.4638	0.4912	0.5192	0.5478	0.5764	0.6052	0.6342	0.6632	0.6922	0.7211
0.009	0.4201	0.4520	0.4772	0.5038	0.5312	0.5592	0.5878	0.6164	0.6452	0.6742	0.7032	0.7322	0.7611
0.010	0.4601	0.4920	0.5172	0.5438	0.5712	0.5992	0.6278	0.6564	0.6852	0.7142	0.7432	0.7722	0.8011
0.011	0.5001	0.5320	0.5572	0.5838	0.6112	0.6392	0.6678	0.6964	0.7252	0.7542	0.7832	0.8122	0.8411
0.012	0.5401	0.5720	0.5972	0.6238	0.6512	0.6792	0.7078	0.7364	0.7652	0.7942	0.8232	0.8522	0.8811
0.013	0.5801	0.6120	0.6372	0.6638	0.6912	0.7192	0.7478	0.7764	0.8052	0.8342	0.8632	0.8922	0.9211
0.014	0.6201	0.6520	0.6772	0.7038	0.7312	0.7592	0.7878	0.8164	0.8452	0.8742	0.9032	0.9322	0.9611
0.015	0.6601	0.6920	0.7172	0.7438	0.7712	0.7992	0.8278	0.8564	0.8852	0.9142	0.9432	0.9722	1.0011
0.016	0.7001	0.7320	0.7572	0.7838	0.8112	0.8392	0.8678	0.8964	0.9252	0.9542	0.9832	1.0122	1.0411
0.017	0.7401	0.7720	0.7972	0.8238	0.8512	0.8792	0.9078	0.9364	0.9652	0.9942	1.0232	1.0522	1.0811
0.018	0.7801	0.8120	0.8372	0.8638	0.8912	0.9192	0.9478	0.9764	1.0052	1.0342	1.0632	1.0922	1.1211
0.019	0.8201	0.8520	0.8772	0.9038	0.9312	0.9592	0.9878	1.0164	1.0452	1.0742	1.1032	1.1322	1.1611
0.020	0.8601	0.8920	0.9172	0.9438	0.9712	0.9992	1.0278	1.0564	1.0852	1.1142	1.1432	1.1722	1.2011
0.021	0.9001	0.9320	0.9572	0.9838	1.0112	1.0392	1.0678	1.0964	1.1252	1.1542	1.1832	1.2122	1.2411
0.022	0.9401	0.9720	0.9972	1.0238	1.0512	1.0792	1.1078	1.1364	1.1652	1.1942	1.2232	1.2522	1.2811
0.023	0.9801	1.0120	1.0372	1.0638	1.0912	1.1192	1.1478	1.1764	1.2052	1.2342	1.2632	1.2922	1.3211
0.024	1.0201	1.0520	1.0772	1.1038	1.1312	1.1592	1.1878	1.2164	1.2452	1.2742	1.3032	1.3322	1.3611
0.025	1.0601	1.0920	1.1172	1.1438	1.1712	1.1992	1.2278	1.2564	1.2852	1.3142	1.3432	1.3722	1.4011
0.026	1.1001	1.1320	1.1572	1.1838	1.2112	1.2392	1.2678	1.2964	1.3252	1.3542	1.3832	1.4122	1.4411
0.027	1.1401	1.1720	1.1972	1.2238	1.2512	1.2792	1.3078	1.3364	1.3652	1.3942	1.4232	1.4522	1.4811
0.028	1.1801	1.2120	1.2372	1.2638	1.2912	1.3192	1.3478	1.3764	1.4052	1.4342	1.4632	1.4922	1.5211
0.029	1.2201	1.2520	1.2772	1.3038	1.3312	1.3592	1.3878	1.4164	1.4452	1.4742	1.5032	1.5322	1.5611
0.030	1.2601	1.2920	1.3172	1.3438	1.3712	1.3992	1.4278	1.4564	1.4852	1.5142	1.5432	1.5722	1.6011
0.031	1.3001	1.3320	1.3572	1.3838	1.4112	1.4392	1.4678	1.4964	1.5252	1.5542	1.5832	1.6122	1.6411
0.032	1.3401	1.3720	1.3972	1.4238	1.4512	1.4792	1.5078	1.5364	1.5652	1.5942	1.6232	1.6522	1.6811
0.033	1.3801	1.4120	1.4372	1.4638	1.4912	1.5192	1.5478	1.5764	1.6052	1.6342	1.6632	1.6922	1.7211
0.034	1.4201	1.4520	1.4772	1.5038	1.5312	1.5592	1.5878	1.6164	1.6452	1.6742	1.7032	1.7322	1.7611
0.035	1.4601	1.4920	1.5172	1.5438	1.5712	1.5992	1.6278	1.6564	1.6852	1.7142	1.7432	1.7722	1.8011
0.036	1.5001	1.5320	1.5572	1.5838	1.6112	1.6392	1.6678	1.6964	1.7252	1.7542	1.7832	1.8122	1.8411
0.037	1.5401	1.5720	1.5972	1.6238	1.6512	1.6792	1.7078	1.7364	1.7652	1.7942	1.8232	1.8522	1.8811
0.038	1.5801	1.6120	1.6372	1.6638	1.6912	1.7192	1.7478	1.7764	1.8052	1.8342	1.8632	1.8922	1.9211
0.039	1.6201	1.6520	1.6772	1.7038	1.7312	1.7592	1.7878	1.8164	1.8452	1.8742	1.9032	1.9322	1.9611
0.040	1.6601	1.6920	1.7172	1.7438	1.7712	1.7992	1.8278	1.8564	1.8852	1.9142	1.9432	1.9722	2.0011
0.041	1.7001	1.7320	1.7572	1.7838	1.8112	1.8392	1.8678	1.8964	1.9252	1.9542	1.9832	2.0122	2.0411
0.042	1.7401	1.7720	1.7972	1.8238	1.8512	1.8792	1.9078	1.9364	1.9652	1.9942	2.0232	2.0522	2.0811
0.043	1.7801	1.8120	1.8372	1.8638	1.8912	1.9192	1.9478	1.9764	2.0052	2.0342	2.0632	2.0922	2.1211
0.044	1.8201	1.8520	1.8772	1.9038	1.9312	1.9592	1.9878	2.0164	2.0452	2.0742	2.1032	2.1322	2.1611
0.045	1.8601	1.8920	1.9172	1.9438	1.9712	1.9992	2.0278	2.0564	2.0852	2.1142	2.1432	2.1722	2.2011
0.046	1.9001	1.9320	1.9572	1.9838	2.0112	2.0392	2.0678	2.0964	2.1252	2.1542	2.1832	2.2122	2.2411
0.047	1.9401	1.9720	1.9972	2.0238	2.0512	2.0792	2.1078	2.1364	2.1652	2.1942	2.2232	2.2522	2.2811
0.048	1.9801	2.0120	2.0372	2.0638	2.0912	2.1192	2.1478	2.1764	2.2052	2.2342	2.2632	2.2922	2.3211
0.049	2.0201	2.0520	2.0772	2.1038	2.1312	2.1592	2.1878	2.2164	2.2452	2.2742	2.3032	2.3322	2.3611
0.050	2.0601	2.0920	2.1172	2.1438	2.1712	2.1992	2.2278	2.2564	2.2852	2.3142	2.3432	2.3722	2.4011
0.051	2.1001	2.1320	2.1572	2.1838	2.2112	2.2392	2.2678	2.2964	2.3252	2.3542	2.3832	2.4122	2.4411
0.052	2.1401	2.1720	2.1972	2.2238	2.2512	2.2792	2.3078	2.3364	2.3652	2.3942	2.4232	2.4522	2.4811
0.053	2.1801	2.2120	2.2372	2.2638	2.2912	2.3192	2.3478	2.3764	2.4052	2.4342	2.4632	2.4922	2.5211
0.054	2.2201	2.2520	2.2772	2.3038	2.3312	2.3592	2.3878	2.4164	2.4452	2.4742	2.5032	2.5322	2.5611
0.055	2.2601	2.2920	2.3172	2.3438	2.3712	2.3992	2.4278	2.4564	2.4852	2.5142	2.5432	2.5722	2.6011
0.056	2.3001	2.3320	2.3572	2.3838	2.4112	2.4392	2.4678	2.4964	2.5252	2.5542	2.5832	2.6122	2.6411
0.057	2.3401	2.3720	2.3972	2.4238	2.4512	2.4792	2.5078	2.5364	2.5652	2.5942	2.6232	2.6522	2.6811
0.058	2.3801	2.4120	2.4372	2.4638	2.4912	2.5192	2.5478	2.5764	2.6052	2.6342	2.6632	2.6922	2.7211
0.059	2.4201	2.4520	2.4772	2.5038	2.5312	2.5592	2.5878	2.6164	2.6452	2.6742	2.7032	2.7322	2.7611
0.060	2.4601	2.4920	2.5172	2.5438	2.5712	2.5992	2.6278	2.6564	2.6852	2.7142	2.7432	2.7722	2.8011
0.061	2.5001	2.5320	2.5572	2.5838	2.6112	2.6392	2.6678	2.6964	2.7252	2.7542	2.7832	2.8122	2.8411
0.062	2.5401	2.5720	2.5972	2.6238	2.6512	2.6792	2.7078	2.7364	2.7652	2.7942	2.8232	2.8522	2.8811
0.063	2.5801	2.6120	2.6372	2.6638	2.6912	2.7192	2.7478	2.7764	2.8052	2.8342	2.8632	2.8922	2.9211
0.064	2.6201	2.6520	2.6772	2.7038	2.7312	2.7592	2.7878	2.8164	2.8452	2.8742	2.9032	2.9322	2.9611
0.065	2.6601	2.6920	2.7172	2.7438	2.7712	2.7992	2.8278	2.8564	2.8852	2.9142	2.9432	2.9722	3.0011
0.066	2.7001	2.7320	2.7572	2.7838	2.8112	2.8392	2.8678	2.8964	2.9252	2.9542	2.9832	3.0122	3.0411
0.067	2.7401	2.7720	2.7972	2.8238	2.8512	2.8792	2.9078	2.9364	2.9652	2.9942	3.0232	3.0522	3.0811
0.068	2.7801	2.8120	2.8372	2.8638	2.8912	2.9192	2.9478	2.9764	3.0052	3.0342	3.0632	3.0922	3.1211
0.069	2.8201	2.8520	2.8772	2.9038	2.9312	2.9592	2.9878	3.0164	3.0452	3.0742	3.1032	3.1322	3.1611
0.070	2.8601	2.8920	2.9172	2.9438	2.9712	2.9992	3.0278	3.0564	3.0852	3.1142	3.1432	3.1722	3.2011
0.071	2.9001	2.9320	2.9572	2.9838	3.0112	3.0392	3.0678	3.0964	3.1252	3.1542	3.1832	3.2122	3.2411
0.072	2.9401	2.9720	2.9972	3.0238	3.0512	3.0792	3.1078	3.1364	3.1652	3.1942	3.2232	3.2522	3.2811
0.073	2.9801	3.0120	3.0372	3.0638	3.0912	3.1192	3.1478	3.1764	3.2052	3.2342	3.2632	3.2922	3.3211
0.074	3.0201	3.0520	3.0772	3.1038	3.1312	3.1592	3.1878	3.2164	3.2452	3.2742	3.3032	3.3322	3.3611
0.075	3.0601	3.0920	3.1172	3.1438	3.1712	3.1992	3.2278	3.2564	3.2852	3.3142	3.3432	3.3722	3.4011
0.076	3.1001	3.1320	3.1572	3.1838	3.2112	3.2392	3.2678	3.2964	3.3252	3.3542	3.3832	3.4122	3.4411
0.077	3.1401	3.1720											

Table 3. (Continued) $\rho = 0.3$.

$F(x y) - \gamma$	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	12.0	14.0	16.0	18.0
0.00	0.3134	0.3879	0.4600	0.5326	0.6060	0.6789	0.7511	0.8224	0.8927	0.9619	0.9890	0.9954	0.9974
0.01	0.3262	0.4017	0.4738	0.5464	0.6198	0.6929	0.7647	0.8356	0.9054	0.9741	0.9911	0.9965	0.9985
0.02	0.3387	0.4142	0.4863	0.5589	0.6323	0.7054	0.7772	0.8484	0.9180	0.9866	0.9936	0.9980	0.9999
0.03	0.3510	0.4265	0.4986	0.5712	0.6446	0.7177	0.7894	0.8610	0.9305	0.9991	0.9961	0.9995	0.9999
0.04	0.3631	0.4386	0.5107	0.5833	0.6567	0.7298	0.8015	0.8730	0.9425	0.9977	0.9947	0.9981	0.9999
0.05	0.3751	0.4506	0.5227	0.5953	0.6687	0.7418	0.8135	0.8850	0.9545	0.9999	0.9969	0.9993	0.9999
0.06	0.3870	0.4626	0.5347	0.6073	0.6807	0.7538	0.8255	0.8970	0.9665	0.9999	0.9969	0.9993	0.9999
0.07	0.3988	0.4745	0.5466	0.6193	0.6927	0.7658	0.8375	0.9090	0.9785	0.9999	0.9969	0.9993	0.9999
0.08	0.4105	0.4864	0.5585	0.6310	0.7044	0.7774	0.8491	0.9206	0.9900	0.9999	0.9969	0.9993	0.9999
0.09	0.4221	0.4982	0.5703	0.6427	0.7161	0.7891	0.8608	0.9323	0.9933	0.9999	0.9969	0.9993	0.9999
0.10	0.4337	0.5100	0.5821	0.6544	0.7281	0.8011	0.8728	0.9445	0.9963	0.9999	0.9969	0.9993	0.9999
0.11	0.4452	0.5217	0.5938	0.6661	0.7398	0.8128	0.8845	0.9562	0.9992	0.9999	0.9969	0.9993	0.9999
0.12	0.4567	0.5334	0.6055	0.6778	0.7515	0.8245	0.8962	0.9679	0.9999	0.9999	0.9969	0.9993	0.9999
0.13	0.4682	0.5451	0.6172	0.6895	0.7632	0.8362	0.9079	0.9796	0.9999	0.9999	0.9969	0.9993	0.9999
0.14	0.4797	0.5568	0.6289	0.7012	0.7749	0.8479	0.9196	0.9913	0.9999	0.9999	0.9969	0.9993	0.9999
0.15	0.4912	0.5685	0.6406	0.7129	0.7866	0.8596	0.9313	0.9930	0.9999	0.9999	0.9969	0.9993	0.9999
0.16	0.5027	0.5802	0.6523	0.7246	0.7983	0.8713	0.9430	0.9947	0.9999	0.9999	0.9969	0.9993	0.9999
0.17	0.5142	0.5919	0.6640	0.7363	0.8100	0.8830	0.9547	0.9964	0.9999	0.9999	0.9969	0.9993	0.9999
0.18	0.5257	0.6036	0.6757	0.7480	0.8217	0.8947	0.9664	0.9981	0.9999	0.9999	0.9969	0.9993	0.9999
0.19	0.5372	0.6153	0.6874	0.7597	0.8334	0.9064	0.9781	0.9998	0.9999	0.9999	0.9969	0.9993	0.9999
0.20	0.5487	0.6270	0.6991	0.7714	0.8451	0.9181	0.9898	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.21	0.5602	0.6387	0.7108	0.7831	0.8568	0.9298	0.9915	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.22	0.5717	0.6504	0.7225	0.7948	0.8685	0.9415	0.9932	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.23	0.5832	0.6621	0.7342	0.8065	0.8802	0.9532	0.9949	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.24	0.5947	0.6738	0.7459	0.8182	0.8919	0.9649	0.9966	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.25	0.6062	0.6855	0.7576	0.8299	0.9036	0.9766	0.9983	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.26	0.6177	0.6972	0.7693	0.8416	0.9153	0.9883	0.9990	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.27	0.6292	0.7089	0.7810	0.8533	0.9270	0.9990	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.28	0.6407	0.7206	0.7927	0.8650	0.9387	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.29	0.6522	0.7323	0.8044	0.8767	0.9504	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.30	0.6637	0.7440	0.8161	0.8884	0.9621	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.31	0.6752	0.7557	0.8278	0.9001	0.9738	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.32	0.6867	0.7674	0.8395	0.9118	0.9855	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.33	0.6982	0.7791	0.8512	0.9235	0.9972	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.34	0.7097	0.7908	0.8629	0.9352	1.0089	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.35	0.7212	0.8025	0.8746	0.9469	1.0206	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.36	0.7327	0.8142	0.8863	0.9586	1.0323	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.37	0.7442	0.8259	0.8980	0.9703	1.0440	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.38	0.7557	0.8376	0.9097	0.9820	1.0557	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.39	0.7672	0.8493	0.9214	0.9937	1.0674	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.40	0.7787	0.8610	0.9331	1.0054	1.0791	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.41	0.7902	0.8727	0.9448	1.0171	1.0908	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.42	0.8017	0.8844	0.9565	1.0288	1.1025	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.43	0.8132	0.8961	0.9682	1.0405	1.1142	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.44	0.8247	0.9078	0.9799	1.0522	1.1259	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.45	0.8362	0.9195	0.9916	1.0639	1.1376	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.46	0.8477	0.9312	1.0033	1.0756	1.1493	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.47	0.8592	0.9429	1.0150	1.0873	1.1610	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.48	0.8707	0.9546	1.0267	1.0990	1.1727	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.49	0.8822	0.9663	1.0384	1.1107	1.1844	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.50	0.8937	0.9780	1.0501	1.1224	1.1961	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.51	0.9052	0.9897	1.0618	1.1341	1.2078	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.52	0.9167	1.0014	1.0735	1.1458	1.2195	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.53	0.9282	1.0131	1.0852	1.1575	1.2312	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.54	0.9397	1.0248	1.0969	1.1692	1.2429	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.55	0.9512	1.0365	1.1086	1.1809	1.2546	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.56	0.9627	1.0482	1.1203	1.1926	1.2663	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.57	0.9742	1.0599	1.1320	1.2043	1.2780	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.58	0.9857	1.0716	1.1437	1.2160	1.2897	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.59	0.9972	1.0833	1.1554	1.2277	1.3014	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.60	1.0087	1.0950	1.1671	1.2394	1.3131	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.61	1.0202	1.1067	1.1788	1.2511	1.3248	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.62	1.0317	1.1184	1.1905	1.2628	1.3365	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.63	1.0432	1.1301	1.2022	1.2745	1.3482	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.64	1.0547	1.1418	1.2139	1.2862	1.3599	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.65	1.0662	1.1535	1.2256	1.2979	1.3716	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.66	1.0777	1.1652	1.2373	1.3096	1.3833	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.67	1.0892	1.1769	1.2490	1.3213	1.3950	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.68	1.1007	1.1886	1.2607	1.3330	1.4067	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.69	1.1122	1.2003	1.2724	1.3447	1.4184	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.70	1.1237	1.2120	1.2841	1.3564	1.4301	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.71	1.1352	1.2237	1.2958	1.3681	1.4418	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.72	1.1467	1.2354	1.3075	1.3798	1.4535	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.73	1.1582	1.2471	1.3192	1.3915	1.4652	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.74	1.1697	1.2588	1.3309	1.4032	1.4769	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.75	1.1812	1.2705	1.3426	1.4149	1.4886	0.9999	0.9999	0.9999	0.9999	0.9999	0.9969	0.9993	0.9999
0.76	1.1927	1.2822	1.3543	1.4266	1.5003	0.9999	0.9999	0.9999	0.9999	0			

Table 5. (Continued) $\rho = 0.5$.

$F(x, y; \lambda)$	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	12.0	14.0	16.0	18.0
0.001	0.1392	-	0.1367	-	0.1344	-	0.1321	-	0.1300	-	0.1277	-	0.1257
0.002	0.1407	-	0.1382	-	0.1358	-	0.1334	-	0.1311	-	0.1287	-	0.1268
0.003	0.1421	-	0.1396	-	0.1372	-	0.1348	-	0.1324	-	0.1300	-	0.1281
0.004	0.1435	-	0.1410	-	0.1386	-	0.1362	-	0.1338	-	0.1314	-	0.1295
0.005	0.1449	-	0.1424	-	0.1400	-	0.1376	-	0.1352	-	0.1328	-	0.1309
0.006	0.1463	-	0.1438	-	0.1414	-	0.1390	-	0.1366	-	0.1342	-	0.1323
0.007	0.1477	-	0.1452	-	0.1428	-	0.1404	-	0.1380	-	0.1356	-	0.1337
0.008	0.1491	-	0.1466	-	0.1442	-	0.1418	-	0.1394	-	0.1370	-	0.1351
0.009	0.1505	-	0.1480	-	0.1456	-	0.1432	-	0.1408	-	0.1384	-	0.1365
0.01	0.1519	-	0.1494	-	0.1470	-	0.1446	-	0.1422	-	0.1398	-	0.1379
0.02	0.1533	-	0.1508	-	0.1484	-	0.1460	-	0.1436	-	0.1412	-	0.1393
0.03	0.1547	-	0.1522	-	0.1498	-	0.1474	-	0.1450	-	0.1426	-	0.1407
0.04	0.1561	-	0.1536	-	0.1512	-	0.1488	-	0.1464	-	0.1440	-	0.1421
0.05	0.1575	-	0.1550	-	0.1526	-	0.1502	-	0.1478	-	0.1454	-	0.1435
0.06	0.1589	-	0.1564	-	0.1540	-	0.1516	-	0.1492	-	0.1468	-	0.1449
0.07	0.1603	-	0.1578	-	0.1554	-	0.1530	-	0.1506	-	0.1482	-	0.1463
0.08	0.1617	-	0.1592	-	0.1568	-	0.1544	-	0.1520	-	0.1496	-	0.1477
0.09	0.1631	-	0.1606	-	0.1582	-	0.1558	-	0.1534	-	0.1510	-	0.1491
0.10	0.1645	-	0.1620	-	0.1596	-	0.1572	-	0.1548	-	0.1524	-	0.1505
0.11	0.1659	-	0.1634	-	0.1610	-	0.1586	-	0.1562	-	0.1538	-	0.1519
0.12	0.1673	-	0.1648	-	0.1624	-	0.1600	-	0.1576	-	0.1552	-	0.1533
0.13	0.1687	-	0.1662	-	0.1638	-	0.1614	-	0.1590	-	0.1566	-	0.1547
0.14	0.1701	-	0.1676	-	0.1652	-	0.1628	-	0.1604	-	0.1580	-	0.1561
0.15	0.1715	-	0.1690	-	0.1666	-	0.1642	-	0.1618	-	0.1594	-	0.1575
0.16	0.1729	-	0.1704	-	0.1680	-	0.1656	-	0.1632	-	0.1608	-	0.1589
0.17	0.1743	-	0.1718	-	0.1694	-	0.1670	-	0.1646	-	0.1622	-	0.1603
0.18	0.1757	-	0.1732	-	0.1708	-	0.1684	-	0.1660	-	0.1636	-	0.1617
0.19	0.1771	-	0.1746	-	0.1722	-	0.1698	-	0.1674	-	0.1650	-	0.1631
0.20	0.1785	-	0.1760	-	0.1736	-	0.1712	-	0.1688	-	0.1664	-	0.1645
0.25	0.1800	-	0.1775	-	0.1751	-	0.1727	-	0.1703	-	0.1679	-	0.1660
0.30	0.1814	-	0.1789	-	0.1765	-	0.1741	-	0.1717	-	0.1693	-	0.1674
0.35	0.1828	-	0.1803	-	0.1779	-	0.1755	-	0.1731	-	0.1707	-	0.1688
0.40	0.1842	-	0.1817	-	0.1793	-	0.1769	-	0.1745	-	0.1721	-	0.1702
0.45	0.1856	-	0.1831	-	0.1807	-	0.1783	-	0.1759	-	0.1735	-	0.1716
0.50	0.1870	-	0.1845	-	0.1821	-	0.1797	-	0.1773	-	0.1749	-	0.1730
0.55	0.1884	-	0.1859	-	0.1835	-	0.1811	-	0.1787	-	0.1763	-	0.1744
0.60	0.1898	-	0.1873	-	0.1849	-	0.1825	-	0.1801	-	0.1777	-	0.1758
0.65	0.1912	-	0.1887	-	0.1863	-	0.1839	-	0.1815	-	0.1791	-	0.1772
0.70	0.1926	-	0.1901	-	0.1877	-	0.1853	-	0.1829	-	0.1805	-	0.1786
0.75	0.1940	-	0.1915	-	0.1891	-	0.1867	-	0.1843	-	0.1819	-	0.1800
0.80	0.1954	-	0.1929	-	0.1905	-	0.1881	-	0.1857	-	0.1833	-	0.1814
0.85	0.1968	-	0.1943	-	0.1919	-	0.1895	-	0.1871	-	0.1847	-	0.1828
0.90	0.1982	-	0.1957	-	0.1933	-	0.1909	-	0.1885	-	0.1861	-	0.1842
0.95	0.1996	-	0.1971	-	0.1947	-	0.1923	-	0.1899	-	0.1875	-	0.1856
1.00	0.2010	-	0.1985	-	0.1961	-	0.1937	-	0.1913	-	0.1889	-	0.1870

Table 6. (Continued) $\rho = 0.6$.

$F(x, y)$	3.50	4.00	4.50	5.00	5.50	6.00	7.00	8.00	9.00	10.00	12.00	14.00	16.00	18.00
0.002	0.3762	0.4657	0.5487	0.6147	0.6687	0.7147	0.7527	0.7827	0.8037	0.8177	0.8257	0.8297	0.8307	0.8317
0.003	0.3792	0.4707	0.5567	0.6247	0.6807	0.7287	0.7687	0.8007	0.8237	0.8387	0.8467	0.8497	0.8507	0.8517
0.004	0.3822	0.4757	0.5647	0.6347	0.6927	0.7427	0.7847	0.8187	0.8437	0.8597	0.8677	0.8707	0.8717	0.8727
0.005	0.3852	0.4807	0.5727	0.6447	0.7047	0.7567	0.8007	0.8367	0.8627	0.8797	0.8877	0.8907	0.8917	0.8927
0.006	0.3882	0.4867	0.5807	0.6547	0.7167	0.7707	0.8167	0.8547	0.8817	0.9007	0.9087	0.9117	0.9127	0.9137
0.01	0.3912	0.4937	0.5897	0.6627	0.7267	0.7827	0.8307	0.8707	0.9007	0.9217	0.9297	0.9327	0.9337	0.9347
0.015	0.3962	0.5037	0.6027	0.6777	0.7447	0.8027	0.8527	0.8947	0.9267	0.9497	0.9577	0.9607	0.9617	0.9627
0.02	0.4012	0.5107	0.6117	0.6887	0.7577	0.8177	0.8687	0.9127	0.9467	0.9717	0.9797	0.9827	0.9837	0.9847
0.03	0.4062	0.5177	0.6207	0.7007	0.7717	0.8337	0.8867	0.9327	0.9687	0.9947	1.0027	1.0057	1.0067	1.0077
0.04	0.4112	0.5247	0.6297	0.7107	0.7837	0.8477	0.9027	0.9507	0.9887	1.0167	1.0247	1.0277	1.0287	1.0297
0.05	0.4162	0.5317	0.6377	0.7197	0.7947	0.8607	0.9167	0.9667	1.0067	1.0367	1.0447	1.0477	1.0487	1.0497
0.06	0.4212	0.5387	0.6457	0.7287	0.8057	0.8737	0.9307	0.9827	1.0247	1.0567	1.0647	1.0677	1.0687	1.0697
0.07	0.4262	0.5457	0.6537	0.7377	0.8167	0.8867	0.9447	0.9987	1.0427	1.0767	1.0847	1.0877	1.0887	1.0897
0.08	0.4312	0.5527	0.6617	0.7467	0.8267	0.8987	0.9587	1.0147	1.0527	1.0887	1.0967	1.0997	1.1007	1.1017
0.09	0.4362	0.5597	0.6697	0.7557	0.8367	0.9107	0.9727	1.0307	1.0707	1.1087	1.1167	1.1197	1.1207	1.1217
0.10	0.4412	0.5667	0.6777	0.7647	0.8467	0.9227	0.9867	1.0467	1.0887	1.1287	1.1367	1.1397	1.1407	1.1417
0.11	0.4462	0.5737	0.6857	0.7737	0.8567	0.9347	1.0007	1.0627	1.1067	1.1487	1.1567	1.1597	1.1607	1.1617
0.12	0.4512	0.5807	0.6937	0.7827	0.8667	0.9527	1.0207	1.0847	1.1307	1.1747	1.1827	1.1857	1.1867	1.1877
0.13	0.4562	0.5877	0.7017	0.7917	0.8847	0.9807	1.0427	1.1087	1.1547	1.1997	1.2077	1.2107	1.2117	1.2127
0.14	0.4612	0.5947	0.7097	0.8007	0.8947	0.9927	1.0567	1.1247	1.1727	1.2197	1.2277	1.2307	1.2317	1.2327
0.15	0.4662	0.6017	0.7177	0.8087	0.9047	1.0047	1.0727	1.1427	1.1927	1.2407	1.2487	1.2517	1.2527	1.2537
0.16	0.4712	0.6087	0.7257	0.8167	0.9147	1.0167	1.0867	1.1587	1.2107	1.2597	1.2677	1.2707	1.2717	1.2727
0.17	0.4762	0.6157	0.7337	0.8247	0.9247	1.0287	1.1007	1.1747	1.2287	1.2797	1.2877	1.2907	1.2917	1.2927
0.18	0.4812	0.6227	0.7417	0.8327	0.9347	1.0407	1.1147	1.1907	1.2447	1.2967	1.3047	1.3077	1.3087	1.3097
0.19	0.4862	0.6297	0.7497	0.8407	0.9447	1.0527	1.1287	1.2067	1.2627	1.3147	1.3227	1.3257	1.3267	1.3277
0.20	0.4912	0.6367	0.7577	0.8487	0.9547	1.0647	1.1427	1.2227	1.2807	1.3247	1.3327	1.3357	1.3367	1.3377
0.25	0.5012	0.6467	0.7677	0.8587	0.9747	1.0847	1.1627	1.2427	1.3027	1.3447	1.3527	1.3557	1.3567	1.3577
0.30	0.5112	0.6567	0.7777	0.8687	0.9947	1.1047	1.1847	1.2667	1.3287	1.3707	1.3787	1.3817	1.3827	1.3837
0.35	0.5212	0.6667	0.7877	0.8787	1.0047	1.1247	1.2067	1.2907	1.3627	1.4047	1.4127	1.4157	1.4167	1.4177
0.40	0.5312	0.6767	0.7977	0.8887	1.0147	1.1447	1.2287	1.3147	1.3887	1.4307	1.4387	1.4417	1.4427	1.4437
0.45	0.5412	0.6867	0.8077	0.8987	1.0247	1.1647	1.2507	1.3387	1.4147	1.4567	1.4647	1.4677	1.4687	1.4697
0.50	0.5512	0.6967	0.8177	0.9087	1.0347	1.1847	1.2687	1.3587	1.4367	1.4787	1.4867	1.4897	1.4907	1.4917
0.55	0.5612	0.7067	0.8277	0.9187	1.0447	1.2047	1.2947	1.3867	1.4667	1.5087	1.5167	1.5197	1.5207	1.5217
0.60	0.5712	0.7167	0.8377	0.9287	1.0547	1.2247	1.3167	1.4087	1.4907	1.5327	1.5407	1.5437	1.5447	1.5457
0.65	0.5812	0.7267	0.8477	0.9387	1.0647	1.2447	1.3367	1.4307	1.5147	1.5567	1.5647	1.5677	1.5687	1.5697
0.70	0.5912	0.7367	0.8577	0.9487	1.0747	1.2647	1.3567	1.4527	1.5387	1.5807	1.5887	1.5917	1.5927	1.5937
0.75	0.6012	0.7467	0.8677	0.9587	1.0847	1.2847	1.3767	1.4747	1.5607	1.6027	1.6107	1.6137	1.6147	1.6157
0.80	0.6112	0.7567	0.8777	0.9687	1.0947	1.3047	1.3967	1.4947	1.5827	1.6247	1.6327	1.6357	1.6367	1.6377
0.85	0.6212	0.7667	0.8877	0.9787	1.1047	1.3247	1.4167	1.5147	1.6027	1.6447	1.6527	1.6557	1.6567	1.6577
0.90	0.6312	0.7767	0.8977	0.9887	1.1147	1.3447	1.4367	1.5367	1.6247	1.6667	1.6747	1.6777	1.6787	1.6797
0.95	0.6412	0.7867	0.9077	0.9987	1.1247	1.3647	1.4567	1.5567	1.6447	1.6867	1.6947	1.6977	1.6987	1.6997
1.00	0.6512	0.7967	0.9177	1.0087	1.1347	1.3847	1.4767	1.5767	1.6647	1.7067	1.7147	1.7177	1.7187	1.7197

Table 7. $\rho = 0.7$.

$F(\xi \eta)$	0.60	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	
0.001	0.602	-1	0.707	-2	0.814	-1	0.921	-1	1.028	-1	1.135	-1
0.002	0.628	-2	0.733	-1	0.840	-2	0.947	-2	1.054	-2	1.161	-2
0.003	0.654	-3	0.759	-3	0.866	-3	0.973	-3	1.080	-3	1.187	-3
0.004	0.680	-4	0.785	-4	0.892	-4	1.000	-4	1.107	-4	1.214	-4
0.005	0.706	-5	0.811	-5	0.918	-5	1.026	-5	1.133	-5	1.240	-5
0.006	0.732	-6	0.837	-6	0.944	-6	1.052	-6	1.159	-6	1.266	-6
0.007	0.758	-7	0.863	-7	0.970	-7	1.078	-7	1.185	-7	1.292	-7
0.008	0.784	-8	0.889	-8	0.996	-8	1.104	-8	1.211	-8	1.318	-8
0.009	0.810	-9	0.915	-9	1.022	-9	1.130	-9	1.237	-9	1.344	-9
0.01	0.836	-10	0.941	-10	1.048	-10	1.156	-10	1.263	-10	1.370	-10
0.02	0.862	-11	0.967	-11	1.074	-11	1.182	-11	1.289	-11	1.396	-11
0.03	0.888	-12	0.993	-12	1.100	-12	1.208	-12	1.315	-12	1.422	-12
0.04	0.914	-13	1.019	-13	1.126	-13	1.234	-13	1.341	-13	1.448	-13
0.05	0.940	-14	1.045	-14	1.152	-14	1.260	-14	1.367	-14	1.474	-14
0.06	0.966	-15	1.071	-15	1.178	-15	1.286	-15	1.393	-15	1.500	-15
0.07	0.992	-16	1.097	-16	1.204	-16	1.312	-16	1.419	-16	1.526	-16
0.08	1.018	-17	1.123	-17	1.230	-17	1.338	-17	1.445	-17	1.552	-17
0.09	1.044	-18	1.149	-18	1.256	-18	1.364	-18	1.471	-18	1.578	-18
0.10	1.070	-19	1.175	-19	1.282	-19	1.390	-19	1.497	-19	1.604	-19
0.11	1.096	-20	1.201	-20	1.308	-20	1.416	-20	1.523	-20	1.630	-20
0.12	1.122	-21	1.227	-21	1.334	-21	1.442	-21	1.549	-21	1.656	-21
0.13	1.148	-22	1.253	-22	1.360	-22	1.468	-22	1.575	-22	1.682	-22
0.14	1.174	-23	1.279	-23	1.386	-23	1.494	-23	1.601	-23	1.708	-23
0.15	1.200	-24	1.305	-24	1.412	-24	1.520	-24	1.627	-24	1.734	-24
0.16	1.226	-25	1.331	-25	1.438	-25	1.546	-25	1.653	-25	1.760	-25
0.17	1.252	-26	1.357	-26	1.464	-26	1.572	-26	1.679	-26	1.786	-26
0.18	1.278	-27	1.383	-27	1.490	-27	1.598	-27	1.705	-27	1.812	-27
0.19	1.304	-28	1.409	-28	1.516	-28	1.624	-28	1.731	-28	1.838	-28
0.20	1.330	-29	1.435	-29	1.542	-29	1.650	-29	1.757	-29	1.864	-29
0.21	1.356	-30	1.461	-30	1.568	-30	1.676	-30	1.783	-30	1.890	-30
0.22	1.382	-31	1.487	-31	1.594	-31	1.702	-31	1.809	-31	1.916	-31
0.23	1.408	-32	1.513	-32	1.620	-32	1.728	-32	1.835	-32	1.942	-32
0.24	1.434	-33	1.539	-33	1.646	-33	1.754	-33	1.861	-33	1.968	-33
0.25	1.460	-34	1.565	-34	1.672	-34	1.780	-34	1.887	-34	1.994	-34
0.26	1.486	-35	1.591	-35	1.698	-35	1.806	-35	1.913	-35	2.020	-35
0.27	1.512	-36	1.617	-36	1.724	-36	1.832	-36	1.939	-36	2.046	-36
0.28	1.538	-37	1.643	-37	1.750	-37	1.858	-37	1.965	-37	2.072	-37
0.29	1.564	-38	1.669	-38	1.776	-38	1.884	-38	1.991	-38	2.098	-38
0.30	1.590	-39	1.695	-39	1.802	-39	1.910	-39	2.017	-39	2.124	-39
0.31	1.616	-40	1.721	-40	1.828	-40	1.936	-40	2.043	-40	2.150	-40
0.32	1.642	-41	1.747	-41	1.854	-41	1.962	-41	2.069	-41	2.176	-41
0.33	1.668	-42	1.773	-42	1.880	-42	1.988	-42	2.095	-42	2.202	-42
0.34	1.694	-43	1.799	-43	1.906	-43	2.014	-43	2.121	-43	2.228	-43
0.35	1.720	-44	1.825	-44	1.932	-44	2.040	-44	2.147	-44	2.254	-44
0.36	1.746	-45	1.851	-45	1.958	-45	2.066	-45	2.173	-45	2.280	-45
0.37	1.772	-46	1.877	-46	1.984	-46	2.092	-46	2.199	-46	2.306	-46
0.38	1.798	-47	1.903	-47	2.010	-47	2.118	-47	2.225	-47	2.332	-47
0.39	1.824	-48	1.929	-48	2.036	-48	2.144	-48	2.251	-48	2.358	-48
0.40	1.850	-49	1.955	-49	2.062	-49	2.170	-49	2.277	-49	2.384	-49
0.41	1.876	-50	1.981	-50	2.088	-50	2.196	-50	2.303	-50	2.410	-50
0.42	1.902	-51	2.007	-51	2.114	-51	2.222	-51	2.329	-51	2.436	-51
0.43	1.928	-52	2.033	-52	2.140	-52	2.248	-52	2.355	-52	2.462	-52
0.44	1.954	-53	2.059	-53	2.166	-53	2.274	-53	2.381	-53	2.488	-53
0.45	1.980	-54	2.085	-54	2.192	-54	2.300	-54	2.407	-54	2.514	-54
0.46	2.006	-55	2.111	-55	2.218	-55	2.326	-55	2.433	-55	2.540	-55
0.47	2.032	-56	2.137	-56	2.244	-56	2.352	-56	2.459	-56	2.566	-56
0.48	2.058	-57	2.163	-57	2.270	-57	2.378	-57	2.485	-57	2.592	-57
0.49	2.084	-58	2.189	-58	2.296	-58	2.404	-58	2.511	-58	2.618	-58
0.50	2.110	-59	2.215	-59	2.322	-59	2.430	-59	2.537	-59	2.644	-59
0.51	2.136	-60	2.241	-60	2.348	-60	2.456	-60	2.563	-60	2.670	-60
0.52	2.162	-61	2.267	-61	2.374	-61	2.482	-61	2.589	-61	2.696	-61
0.53	2.188	-62	2.293	-62	2.400	-62	2.508	-62	2.615	-62	2.722	-62
0.54	2.214	-63	2.319	-63	2.426	-63	2.534	-63	2.641	-63	2.748	-63
0.55	2.240	-64	2.345	-64	2.452	-64	2.560	-64	2.667	-64	2.774	-64
0.56	2.266	-65	2.371	-65	2.478	-65	2.586	-65	2.693	-65	2.800	-65
0.57	2.292	-66	2.397	-66	2.504	-66	2.612	-66	2.719	-66	2.826	-66
0.58	2.318	-67	2.423	-67	2.530	-67	2.638	-67	2.745	-67	2.852	-67
0.59	2.344	-68	2.449	-68	2.556	-68	2.664	-68	2.771	-68	2.878	-68
0.60	2.370	-69	2.475	-69	2.582	-69	2.690	-69	2.797	-69	2.904	-69
0.61	2.396	-70	2.501	-70	2.608	-70	2.716	-70	2.823	-70	2.930	-70
0.62	2.422	-71	2.527	-71	2.634	-71	2.742	-71	2.849	-71	2.956	-71
0.63	2.448	-72	2.553	-72	2.660	-72	2.768	-72	2.875	-72	2.982	-72
0.64	2.474	-73	2.579	-73	2.686	-73	2.794	-73	2.901	-73	3.008	-73
0.65	2.500	-74	2.605	-74	2.712	-74	2.820	-74	2.927	-74	3.034	-74
0.66	2.526	-75	2.631	-75	2.738	-75	2.846	-75	2.953	-75	3.060	-75
0.67	2.552	-76	2.657	-76	2.764	-76	2.872	-76	2.979	-76	3.086	-76
0.68	2.578	-77	2.683	-77	2.790	-77	2.898	-77	3.005	-77	3.112	-77
0.69	2.604	-78	2.709	-78	2.816	-78	2.924	-78	3.031	-78	3.138	-78
0.70	2.630	-79	2.735	-79	2.842	-79	2.950	-79	3.057	-79	3.164	-79
0.71	2.656	-80	2.761	-80	2.868	-80	2.976	-80	3.083	-80	3.190	-80
0.72	2.682	-81	2.787	-81	2.894	-81	3.002	-81	3.109	-81	3.216	-81
0.73	2.708	-82	2.813	-82	2.920	-82	3.028	-82	3.135	-82	3.242	-82
0.74	2.734	-83	2.839	-83	2.946	-83	3.054	-83	3.161	-83	3.268	-83
0.75	2.760	-84	2.865	-84	2.972	-84	3.080	-84	3.187	-84	3.294	-84
0.76	2.786	-85	2.891	-85	2.998	-85	3.106	-85	3.213	-85	3.320	-85
0.77	2.812	-86	2.917	-86	3.024	-86	3.132	-86	3.239	-86	3.346	-86
0.78	2.838	-87	2.943	-87	3.050	-87	3.158	-87	3.265	-87	3.372	-87
0.79	2.864	-88	2.969	-88	3.076	-88	3.184	-88	3.291	-88	3.398	-88
0.80	2.890	-89	2.995	-89	3.102	-89	3.210	-89	3.317	-89	3.424	-89
0.81	2.916	-90	3.021	-90	3.128	-90	3.236	-90	3.343	-90	3.450	-90
0.82	2.942	-91	3.047	-91	3.154	-91	3.262	-91	3.369	-91	3.476	-91
0.83	2.968	-92	3.073	-92	3.180	-92	3.288	-92	3.395	-92	3.502	-92
0.84	2.994	-93	3.099	-93	3.206	-93	3.314	-93	3.421	-93	3.528	-93
0.85	3.020	-94	3.125	-94	3.232	-94	3.340	-94	3.447	-94	3.554	-94
0.86	3.046	-95	3.151	-95	3.258	-95	3.366	-95	3.473	-95	3.580	-95
0.87	3.072	-96	3.177	-96	3.284	-96	3.392	-96	3.499	-96	3.606	-96
0.88	3.098	-97	3.203	-97	3.310	-97	3.418	-97	3.525	-97	3.632	-97
0.89	3.124	-98	3.229	-98	3.336	-98	3.444	-98	3.551	-98	3.658	-98
0.90	3.150	-99	3.255	-99	3.362	-99	3.470	-99	3.577	-99	3.684	-99
0.91	3.176	-100	3.281	-100	3.388	-100	3.496	-100	3.603	-100	3.710	-100
0.92	3.202	-101	3.307	-101	3.414	-101	3.522	-101	3.629	-101	3.736	-101
0.93	3.228	-102	3.333	-102	3.440	-102	3.548	-102	3.655	-102	3.762	-102
0.94	3.254	-103	3.359	-103	3.466	-103	3.574	-103	3.681	-103	3.788	-103
0.95	3.280	-104	3.385	-104	3.492	-104	3.600	-104	3.707	-104	3.814	-104
0.96	3.30											

Table 7. (Continued) $\rho = 0.7$.

$F(\xi \eta)$	3.50	4.00	4.50	5.00	6.00	7.00	8.00	9.00	10.00	12.00	14.00	16.00	18.00
0.001	0.2077	0.3598	0.4183	0.4590	0.5274	0.6134	0.7172	0.8322	0.9510	1.0769	1.2103	1.3515	1.4997
0.002	0.2874	0.4859	0.5663	0.6242	0.7207	0.8407	0.9742	1.1199	1.2761	1.4411	1.6142	1.7947	1.9818
0.003	0.3377	0.5700	0.6719	0.7484	0.8747	1.0189	1.1799	1.3454	1.5134	1.6821	1.8506	2.0180	2.1844
0.004	0.3723	0.6359	0.7590	0.8486	1.0000	1.1717	1.3599	1.5524	1.7471	1.9421	2.1363	2.3297	2.5224
0.005	0.4020	0.7050	0.8400	0.9420	1.1200	1.3200	1.5300	1.7400	1.9500	2.1600	2.3700	2.5800	2.7900
0.006	0.4270	0.7784	0.9250	1.0380	1.2400	1.4700	1.7100	1.9500	2.1900	2.4300	2.6700	2.9100	3.1500
0.007	0.4480	0.8470	1.0050	1.1280	1.3600	1.6200	1.8900	2.1600	2.4300	2.7000	2.9700	3.2400	3.5100
0.008	0.4650	0.9120	1.0800	1.2150	1.4800	1.7800	2.0700	2.3600	2.6500	2.9400	3.2300	3.5200	3.8100
0.009	0.4790	0.9700	1.1500	1.2900	1.5800	1.9000	2.2100	2.5100	2.8100	3.1100	3.4100	3.7100	4.0100
0.010	0.4910	1.0250	1.2150	1.3600	1.6800	2.0300	2.3500	2.6600	2.9700	3.2800	3.5900	3.9000	4.2100
0.020	0.5700	1.2500	1.4800	1.6500	2.1500	2.5500	2.9500	3.3500	3.7500	4.1500	4.5500	4.9500	5.3500
0.030	0.6300	1.4500	1.7000	1.9000	2.4500	2.9500	3.4500	3.9500	4.4500	4.9500	5.4500	5.9500	6.4500
0.040	0.6800	1.6000	1.8800	2.1000	2.7000	3.3000	3.8000	4.3000	4.8000	5.3000	5.8000	6.3000	6.8000
0.050	0.7200	1.7200	2.0200	2.2500	2.9500	3.6000	4.1000	4.6000	5.1000	5.6000	6.1000	6.6000	7.1000
0.060	0.7500	1.8200	2.1500	2.4000	3.1000	3.8000	4.4000	5.0000	5.6000	6.2000	6.8000	7.4000	8.0000
0.070	0.7700	1.9000	2.2500	2.5000	3.2000	3.9000	4.5000	5.1000	5.7000	6.3000	6.9000	7.5000	8.1000
0.080	0.7800	1.9500	2.3000	2.5500	3.2500	3.9500	4.5500	5.1500	5.7500	6.3500	6.9500	7.5500	8.1500
0.090	0.7900	1.9800	2.3200	2.5800	3.2800	3.9800	4.5800	5.1800	5.7800	6.3800	6.9800	7.5800	8.1800
0.100	0.7950	1.9900	2.3300	2.5900	3.2900	3.9900	4.5900	5.1900	5.7900	6.3900	6.9900	7.5900	8.1900
0.150	0.8300	2.0500	2.3800	2.6500	3.3500	4.0500	4.6500	5.2500	5.8500	6.4500	7.0500	7.6500	8.2500
0.200	0.8500	2.1000	2.4200	2.7000	3.4000	4.1000	4.7000	5.3000	5.9000	6.5000	7.1000	7.7000	8.3000
0.250	0.8600	2.1200	2.4400	2.7200	3.4200	4.1200	4.7200	5.3200	5.9200	6.5200	7.1200	7.7200	8.3200
0.300	0.8650	2.1300	2.4500	2.7300	3.4300	4.1300	4.7300	5.3300	5.9300	6.5300	7.1300	7.7300	8.3300
0.350	0.8680	2.1350	2.4550	2.7350	3.4350	4.1350	4.7350	5.3350	5.9350	6.5350	7.1350	7.7350	8.3350
0.400	0.8700	2.1400	2.4600	2.7400	3.4400	4.1400	4.7400	5.3400	5.9400	6.5400	7.1400	7.7400	8.3400
0.450	0.8710	2.1420	2.4620	2.7420	3.4420	4.1420	4.7420	5.3420	5.9420	6.5420	7.1420	7.7420	8.3420
0.500	0.8720	2.1440	2.4640	2.7440	3.4440	4.1440	4.7440	5.3440	5.9440	6.5440	7.1440	7.7440	8.3440
0.550	0.8730	2.1450	2.4650	2.7450	3.4450	4.1450	4.7450	5.3450	5.9450	6.5450	7.1450	7.7450	8.3450
0.600	0.8740	2.1460	2.4660	2.7460	3.4460	4.1460	4.7460	5.3460	5.9460	6.5460	7.1460	7.7460	8.3460
0.650	0.8750	2.1470	2.4670	2.7470	3.4470	4.1470	4.7470	5.3470	5.9470	6.5470	7.1470	7.7470	8.3470
0.700	0.8760	2.1480	2.4680	2.7480	3.4480	4.1480	4.7480	5.3480	5.9480	6.5480	7.1480	7.7480	8.3480
0.750	0.8770	2.1490	2.4690	2.7490	3.4490	4.1490	4.7490	5.3490	5.9490	6.5490	7.1490	7.7490	8.3490
0.800	0.8780	2.1500	2.4700	2.7500	3.4500	4.1500	4.7500	5.3500	5.9500	6.5500	7.1500	7.7500	8.3500
0.850	0.8790	2.1510	2.4710	2.7510	3.4510	4.1510	4.7510	5.3510	5.9510	6.5510	7.1510	7.7510	8.3510
0.900	0.8800	2.1520	2.4720	2.7520	3.4520	4.1520	4.7520	5.3520	5.9520	6.5520	7.1520	7.7520	8.3520
0.950	0.8810	2.1530	2.4730	2.7530	3.4530	4.1530	4.7530	5.3530	5.9530	6.5530	7.1530	7.7530	8.3530
1.000	0.8820	2.1540	2.4740	2.7540	3.4540	4.1540	4.7540	5.3540	5.9540	6.5540	7.1540	7.7540	8.3540

Table 9. $\rho = 0.9$.

$F(\xi \eta \gamma)$	0.00	7.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
0.001	0.1003	0.6432	0.1834	0.1960	0.0071	0.1697	0.3312	0.4918	0.6506	0.8108	0.9696	1.1251	1.2780
0.002	0.2002	0.1816	0.1432	0.1466	0.1269	0.1528	0.1812	0.2085	0.2348	0.2602	0.2856	0.3110	0.3364
0.003	0.3005	0.2758	0.1985	0.1814	0.1410	0.1534	0.1818	0.2091	0.2354	0.2618	0.2882	0.3146	0.3410
0.004	0.4008	0.3710	0.2487	0.1959	0.1385	0.1509	0.1793	0.2066	0.2330	0.2594	0.2858	0.3122	0.3386
0.006	0.6012	0.5526	0.3734	0.2544	0.1916	0.2031	0.2315	0.2599	0.2883	0.3167	0.3451	0.3735	0.4019
0.007	0.7025	0.6350	0.4475	0.3059	0.2360	0.2475	0.2760	0.3044	0.3328	0.3612	0.3896	0.4180	0.4464
0.008	0.8025	0.7286	0.4975	0.3404	0.2645	0.2760	0.3045	0.3330	0.3615	0.3899	0.4184	0.4469	0.4753
0.009	0.9041	0.8184	0.5456	0.3781	0.2971	0.3086	0.3371	0.3656	0.3941	0.4226	0.4511	0.4796	0.5081
0.01	0.2000	0.2723	0.1725	0.1648	0.1716	0.1778	0.1840	0.1902	0.1964	0.2026	0.2088	0.2150	0.2212
0.02	0.4082	0.3205	0.2485	0.2310	0.2391	0.2472	0.2553	0.2634	0.2715	0.2796	0.2877	0.2958	0.3039
0.03	0.5139	0.3691	0.3184	0.2936	0.3069	0.3150	0.3231	0.3312	0.3393	0.3474	0.3555	0.3636	0.3717
0.04	0.6189	0.4585	0.4046	0.3749	0.3859	0.3940	0.4021	0.4102	0.4183	0.4264	0.4345	0.4426	0.4507
0.05	0.7237	0.5383	0.4828	0.4489	0.4570	0.4651	0.4732	0.4813	0.4894	0.4975	0.5056	0.5137	0.5218
0.06	0.8287	0.5797	0.5191	0.4820	0.4901	0.4982	0.5063	0.5144	0.5225	0.5306	0.5387	0.5468	0.5549
0.07	0.9337	0.6395	0.5759	0.5357	0.5438	0.5519	0.5600	0.5681	0.5762	0.5843	0.5924	0.6005	0.6086
0.08	0.4943	0.4395	0.3759	0.3327	0.4068	0.4122	0.4186	0.4250	0.4314	0.4378	0.4442	0.4506	0.4570
0.09	0.5943	0.5395	0.4759	0.4327	0.4868	0.4922	0.4986	0.5050	0.5114	0.5178	0.5242	0.5306	0.5370
0.10	0.6943	0.6395	0.5759	0.5327	0.5868	0.5922	0.5986	0.6050	0.6114	0.6178	0.6242	0.6306	0.6370
0.11	0.7943	0.7395	0.6759	0.6327	0.6868	0.6922	0.6986	0.7050	0.7114	0.7178	0.7242	0.7306	0.7370
0.12	0.8943	0.8395	0.7759	0.7327	0.7868	0.7922	0.7986	0.8050	0.8114	0.8178	0.8242	0.8306	0.8370
0.13	0.9943	0.9395	0.8759	0.8327	0.8868	0.8922	0.8986	0.9050	0.9114	0.9178	0.9242	0.9306	0.9370
0.14	0.1094	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.15	0.1123	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.16	0.1152	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.17	0.1181	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.18	0.1210	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.19	0.1239	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.20	0.1268	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.21	0.1297	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.22	0.1326	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.23	0.1355	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.24	0.1384	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.25	0.1413	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.26	0.1442	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.27	0.1471	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.28	0.1500	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.29	0.1529	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.30	0.1558	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.31	0.1587	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.32	0.1616	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.33	0.1645	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.34	0.1674	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.35	0.1703	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.36	0.1732	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.37	0.1761	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.38	0.1790	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.39	0.1819	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.40	0.1848	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.41	0.1877	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.42	0.1906	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.43	0.1935	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.44	0.1964	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.45	0.1993	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.46	0.2022	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.47	0.2051	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.48	0.2080	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.49	0.2109	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.50	0.2138	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.51	0.2167	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.52	0.2196	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.53	0.2225	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.54	0.2254	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.55	0.2283	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.56	0.2312	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.57	0.2341	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.58	0.2370	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.59	0.2399	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.60	0.2428	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.61	0.2457	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.62	0.2486	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.63	0.2515	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.64	0.2544	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.65	0.2573	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.66	0.2602	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.67	0.2631	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.68	0.2660	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.2914	1.4685	1.6416	1.8107	1.9758
0.69	0.2689	0.6737	0.2343	0.3909	0.5717	0.7418	0.9280	1.1112	1.				

Table 9. (Continued) $\rho = 0.9$.

$F(E T) \backslash$	3.50	4.00	4.50	5.00	6.00	7.00	8.00	9.00	10.00	12.00	14.00	16.00	18.00
0.001	0.1313 +i	0.1495 +i	0.1787 +i	0.2087 +i	0.2704 +i	0.3349 +i	0.4012 +i	0.4687 +i	0.5375 +i	0.6070 +i	0.6768 +i	0.7468 +i	0.8169 +i
0.002	0.1319 +i	0.1502 +i	0.1805 +i	0.2115 +i	0.2746 +i	0.3409 +i	0.4092 +i	0.4793 +i	0.5501 +i	0.6216 +i	0.6938 +i	0.7667 +i	0.8394 +i
0.003	0.1325 +i	0.1510 +i	0.1817 +i	0.2133 +i	0.2775 +i	0.3459 +i	0.4159 +i	0.4878 +i	0.5603 +i	0.6334 +i	0.7071 +i	0.7814 +i	0.8554 +i
0.004	0.1331 +i	0.1518 +i	0.1830 +i	0.2153 +i	0.2809 +i	0.3507 +i	0.4222 +i	0.4958 +i	0.5701 +i	0.6450 +i	0.7204 +i	0.7963 +i	0.8719 +i
0.005	0.1337 +i	0.1526 +i	0.1843 +i	0.2171 +i	0.2838 +i	0.3551 +i	0.4279 +i	0.5034 +i	0.5793 +i	0.6557 +i	0.7326 +i	0.8099 +i	0.8869 +i
0.006	0.1343 +i	0.1536 +i	0.1858 +i	0.2194 +i	0.2871 +i	0.3603 +i	0.4335 +i	0.5107 +i	0.5875 +i	0.6649 +i	0.7427 +i	0.8208 +i	0.8986 +i
0.007	0.1349 +i	0.1547 +i	0.1874 +i	0.2218 +i	0.2910 +i	0.3661 +i	0.4402 +i	0.5191 +i	0.5965 +i	0.6745 +i	0.7529 +i	0.8315 +i	0.9101 +i
0.008	0.1355 +i	0.1559 +i	0.1903 +i	0.2244 +i	0.2956 +i	0.3714 +i	0.4479 +i	0.5285 +i	0.6065 +i	0.6851 +i	0.7640 +i	0.8431 +i	0.9222 +i
0.009	0.1361 +i	0.1572 +i	0.1932 +i	0.2274 +i	0.3009 +i	0.3772 +i	0.4564 +i	0.5387 +i	0.6183 +i	0.6978 +i	0.7774 +i	0.8571 +i	0.9371 +i
0.01	0.1367 +i	0.1586 +i	0.1963 +i	0.2307 +i	0.3067 +i	0.3834 +i	0.4657 +i	0.5497 +i	0.6309 +i	0.7112 +i	0.7914 +i	0.8717 +i	0.9522 +i
0.02	0.1378 +i	0.1612 +i	0.2018 +i	0.2362 +i	0.3143 +i	0.3925 +i	0.4811 +i	0.5671 +i	0.6498 +i	0.7321 +i	0.8141 +i	0.8958 +i	0.9775 +i
0.03	0.1390 +i	0.1640 +i	0.2078 +i	0.2428 +i	0.3235 +i	0.4033 +i	0.4950 +i	0.5837 +i	0.6689 +i	0.7524 +i	0.8352 +i	0.9177 +i	0.9999 +i
0.04	0.1403 +i	0.1670 +i	0.2149 +i	0.2504 +i	0.3342 +i	0.4174 +i	0.5127 +i	0.6034 +i	0.6907 +i	0.7752 +i	0.8587 +i	0.9410 +i	1.0227 +i
0.05	0.1417 +i	0.1703 +i	0.2226 +i	0.2591 +i	0.3475 +i	0.4337 +i	0.5327 +i	0.6259 +i	0.7147 +i	0.7999 +i	0.8831 +i	0.9650 +i	1.0463 +i
0.06	0.1432 +i	0.1739 +i	0.2314 +i	0.2690 +i	0.3634 +i	0.4526 +i	0.5557 +i	0.6517 +i	0.7420 +i	0.8280 +i	0.9117 +i	0.9940 +i	1.0753 +i
0.07	0.1448 +i	0.1778 +i	0.2414 +i	0.2803 +i	0.3819 +i	0.4744 +i	0.5814 +i	0.6804 +i	0.7721 +i	0.8585 +i	0.9424 +i	1.0247 +i	1.1057 +i
0.08	0.1465 +i	0.1820 +i	0.2526 +i	0.2932 +i	0.4034 +i	0.4995 +i	0.6104 +i	0.7124 +i	0.8061 +i	0.8921 +i	0.9756 +i	1.0575 +i	1.1372 +i
0.09	0.1483 +i	0.1866 +i	0.2652 +i	0.3078 +i	0.4282 +i	0.5282 +i	0.6429 +i	0.7487 +i	0.8441 +i	0.9296 +i	1.0139 +i	1.0967 +i	1.1779 +i
0.10	0.1502 +i	0.1916 +i	0.2794 +i	0.3242 +i	0.4568 +i	0.5698 +i	0.6874 +i	0.8057 +i	0.9024 +i	0.9883 +i	1.0721 +i	1.1546 +i	1.2356 +i
0.12	0.1536 +i	0.2001 +i	0.2991 +i	0.3448 +i	0.4978 +i	0.6166 +i	0.7390 +i	0.8599 +i	0.9578 +i	1.0441 +i	1.1274 +i	1.2092 +i	1.2893 +i
0.13	0.1562 +i	0.2091 +i	0.3198 +i	0.3674 +i	0.5344 +i	0.6584 +i	0.7854 +i	0.9093 +i	1.0084 +i	1.0941 +i	1.1770 +i	1.2582 +i	1.3377 +i
0.14	0.1589 +i	0.2186 +i	0.3416 +i	0.3921 +i	0.5768 +i	0.7047 +i	0.8364 +i	0.9630 +i	1.0634 +i	1.1487 +i	1.2322 +i	1.3130 +i	1.3923 +i
0.15	0.1618 +i	0.2286 +i	0.3647 +i	0.4186 +i	0.6254 +i	0.7594 +i	0.8958 +i	1.0257 +i	1.1273 +i	1.2122 +i	1.2956 +i	1.3759 +i	1.4543 +i
0.16	0.1648 +i	0.2392 +i	0.3893 +i	0.4476 +i	0.6807 +i	0.8212 +i	0.9627 +i	1.0967 +i	1.2000 +i	1.2843 +i	1.3675 +i	1.4470 +i	1.5245 +i
0.17	0.1680 +i	0.2505 +i	0.4156 +i	0.4794 +i	0.7434 +i	0.8894 +i	1.0359 +i	1.1737 +i	1.2784 +i	1.3621 +i	1.4447 +i	1.5236 +i	1.6000 +i
0.18	0.1714 +i	0.2626 +i	0.4438 +i	0.5141 +i	0.8144 +i	0.9644 +i	1.1159 +i	1.2579 +i	1.3630 +i	1.4461 +i	1.5279 +i	1.6059 +i	1.6817 +i
0.19	0.1750 +i	0.2756 +i	0.4743 +i	0.5521 +i	0.8944 +i	1.0544 +i	1.2114 +i	1.3574 +i	1.4629 +i	1.5454 +i	1.6265 +i	1.7037 +i	1.7783 +i
0.20	0.1788 +i	0.2895 +i	0.5064 +i	0.5998 +i	0.9854 +i	1.1514 +i	1.3134 +i	1.4617 +i	1.5676 +i	1.6494 +i	1.7297 +i	1.8057 +i	1.8787 +i
0.25	0.1917 +i	0.3315 +i	0.5778 +i	0.6871 +i	1.1714 +i	1.3744 +i	1.5744 +i	1.7644 +i	1.8604 +i	1.9314 +i	1.9974 +i	2.0584 +i	2.1144 +i
0.30	0.2074 +i	0.3845 +i	0.6744 +i	0.8071 +i	1.4114 +i	1.6314 +i	1.8244 +i	2.0044 +i	2.1744 +i	2.3244 +i	2.4544 +i	2.5744 +i	2.6844 +i
0.35	0.2264 +i	0.4515 +i	0.7944 +i	0.9571 +i	1.6814 +i	1.9314 +i	2.1544 +i	2.3544 +i	2.5344 +i	2.6944 +i	2.8344 +i	2.9544 +i	3.0644 +i
0.40	0.2494 +i	0.5315 +i	0.9444 +i	1.1371 +i	2.0014 +i	2.2814 +i	2.5314 +i	2.7514 +i	2.9314 +i	3.0814 +i	3.2014 +i	3.3014 +i	3.3914 +i
0.45	0.2764 +i	0.6245 +i	1.1144 +i	1.3371 +i	2.3114 +i	2.6314 +i	2.9114 +i	3.1514 +i	3.3514 +i	3.5114 +i	3.6314 +i	3.7314 +i	3.8114 +i
0.50	0.3084 +i	0.7345 +i	1.4144 +i	1.6371 +i	2.6414 +i	3.0214 +i	3.3614 +i	3.6514 +i	3.8914 +i	4.0814 +i	4.2314 +i	4.3514 +i	4.4414 +i
0.55	0.3464 +i	0.8645 +i	1.7444 +i	1.9871 +i	3.0914 +i	3.5214 +i	3.9114 +i	4.2514 +i	4.5414 +i	4.7314 +i	4.8814 +i	4.9914 +i	5.0714 +i
0.60	0.3914 +i	1.0145 +i	2.1144 +i	2.3871 +i	3.5714 +i	4.0414 +i	4.4314 +i	4.7714 +i	5.0614 +i	5.2514 +i	5.4014 +i	5.5114 +i	5.5914 +i
0.65	0.4444 +i	1.1845 +i	2.5144 +i	2.8171 +i	4.0914 +i	4.6114 +i	5.0214 +i	5.3614 +i	5.6514 +i	5.8414 +i	5.9914 +i	6.1014 +i	6.1814 +i
0.70	0.5064 +i	1.3845 +i	2.9444 +i	3.2671 +i	4.6414 +i	5.1614 +i	5.5714 +i	5.9114 +i	6.2014 +i	6.3914 +i	6.5414 +i	6.6514 +i	6.7314 +i
0.75	0.5784 +i	1.6145 +i	3.4144 +i	3.7671 +i	5.2114 +i	5.7414 +i	6.1514 +i	6.5014 +i	6.7914 +i	6.9814 +i	7.1314 +i	7.2414 +i	7.3214 +i
0.80	0.6614 +i	1.8745 +i	3.9444 +i	4.2671 +i	5.8114 +i	6.3414 +i	6.7514 +i	7.1014 +i	7.3914 +i	7.5814 +i	7.7314 +i	7.8414 +i	7.9214 +i
0.85	0.7564 +i	2.1745 +i	4.5144 +i	4.8671 +i	6.4414 +i	6.9714 +i	7.3814 +i	7.7314 +i	8.0214 +i	8.2114 +i	8.3614 +i	8.4714 +i	8.5514 +i
0.90	0.8744 +i	2.5245 +i	5.1444 +i	5.4971 +i	7.1114 +i	7.6414 +i	8.0514 +i	8.4014 +i	8.6914 +i	8.8814 +i	9.0314 +i	9.1414 +i	9.2214 +i
0.95	1.0164 +i	2.9345 +i	5.8444 +i	6.1971 +i	7.8414 +i	8.3714 +i	8.7814 +i	9.1314 +i	9.4214 +i	9.6114 +i	9.7614 +i	9.8714 +i	9.9514 +i
0.99	1.1864 +i	3.4245 +i	6.6144 +i	6.9671 +i	8.6414 +i	9.1714 +i	9.5814 +i	9.9314 +i	10.2214 +i	10.4114 +i	10.5614 +i	10.6714 +i	10.7514 +i
1.00	1.3864 +i	4.0045 +i	7.5144 +i	7.8671 +i	9.6414 +i	10.1714 +i	10.5814 +i	10.9314 +i	11.2214 +i	11.4114 +i	11.5614 +i	11.6714 +i	11.7514 +i