



# **Sixth Term Examination Papers**

# **MATHEMATICS**

LIST OF FORMULAE

AND STATISTICAL

TABLES

### **Pure Mathematics**

### Mensuration

Surface area of sphere =  $4\pi r^2$ 

Area of curved surface of cone =  $\pi r \times \text{slant height}$ 

## Trigonometry

$$a^2 = b^2 + c^2 - 2bc \cos A$$

### Arithmetic Series

$$u_n = a + (n-1)d$$
  
$$S_n = \frac{1}{2}n(a+l) = \frac{1}{2}n\{2a + (n-1)d\}$$

### Geometric Series

$$u_n = ar^{n-1}$$
 
$$S_n = \frac{a(1 - r^n)}{1 - r}$$
 
$$S_{\infty} = \frac{a}{1 - r} \quad \text{for } |r| < 1$$

### Summations

$$\sum_{r=1}^{n} r^2 = \frac{1}{6}n(n+1)(2n+1)$$
$$\sum_{r=1}^{n} r^3 = \frac{1}{4}n^2(n+1)^2$$

## Binomial Series

$$\binom{n}{r} + \binom{n}{r+1} = \binom{n+1}{r+1}$$

$$(a+b)^n = a^n + \binom{n}{1} a^{n-1}b + \binom{n}{2} a^{n-2}b^2 + \dots + \binom{n}{r} a^{n-r}b^r + \dots + b^n \qquad (n \in \mathbb{N}),$$

$$\text{where } \binom{n}{r} = {}^n\mathbf{C}_r = \frac{n!}{r!(n-r)!}$$

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{1.2}x^2 + \dots + \frac{n(n-1)\dots(n-r+1)}{1.2.3\dots r}x^r + \dots \qquad (|x| < 1, \ n \in \mathbb{R})$$

## Logarithms and exponentials

$$e^{x \ln a} = a^x$$

### **Complex Numbers**

$$\{r(\cos\theta + i\sin\theta)\}^n = r^n(\cos n\theta + i\sin n\theta)$$
$$e^{i\theta} = \cos\theta + i\sin\theta$$

The roots of  $z^n = 1$  are given by  $z = e^{\frac{2\pi ki}{n}}$ , for  $k = 0, 1, 2, \ldots, n-1$ 

### Maclaurin's Series

$$f(x) = f(0) + xf'(0) + \frac{x^2}{2!}f''(0) + \dots + \frac{x^r}{r!}f^{(r)}(0) + \dots$$

$$e^x = \exp(x) = 1 + x + \frac{x^2}{2!} + \dots + \frac{x^r}{r!} + \dots \quad \text{for all } x$$

$$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \dots + (-1)^{r+1}\frac{x^r}{r} + \dots \quad (-1 < x \le 1)$$

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots + (-1)^r \frac{x^{2r+1}}{(2r+1)!} + \dots \quad \text{for all } x$$

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \dots + (-1)^r \frac{x^{2r}}{(2r)!} + \dots \quad \text{for all } x$$

$$\tan^{-1} x = x - \frac{x^3}{3} + \frac{x^5}{5} - \dots + (-1)^r \frac{x^{2r+1}}{2r+1} + \dots \quad (-1 \le x \le 1)$$

$$\sinh x = x + \frac{x^3}{3!} + \frac{x^5}{5!} + \dots + \frac{x^{2r+1}}{(2r+1)!} + \dots \quad \text{for all } x$$

$$\cosh x = 1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \dots + \frac{x^{2r}}{(2r)!} + \dots \quad \text{for all } x$$

$$\tanh^{-1} x = x + \frac{x^3}{3} + \frac{x^5}{5} + \dots + \frac{x^{2r+1}}{(2r+1)!} + \dots \quad \text{for all } x$$

# Hyperbolic Functions

$$\cosh^{2} x - \sinh^{2} x = 1$$

$$\sinh 2x = 2 \sinh x \cosh x$$

$$\cosh 2x = \cosh^{2} x + \sinh^{2} x$$

$$\cosh^{-1} x = \ln\{x + \sqrt{(x^{2} - 1)}\} \quad (x \ge 1)$$

$$\sinh^{-1} x = \ln\{x + \sqrt{(x^{2} + 1)}\}$$

$$\tanh^{-1} x = \frac{1}{2} \ln\left(\frac{1 + x}{1 - x}\right) \quad (|x| < 1)$$

### Coordinate Geometry

The perpendicular distance from (h, k) to ax + by + c = 0 is  $\frac{|ah + bk + c|}{\sqrt{(a^2 + b^2)}}$ 

The acute angle between lines with gradients  $m_1$  and  $m_2$  is  $\tan^{-1} \left| \frac{m_1 - m_2}{1 + m_1 m_2} \right|$ 

# Trigonometric Identities

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B} \quad \left(A \pm B \neq \left(k + \frac{1}{2}\right)\pi\right)$$
For  $t = \tan\frac{1}{2}A$ :  $\sin A = \frac{2t}{1+t^2}$ ,  $\cos A = \frac{1-t^2}{1+t^2}$ 

$$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2}$$

$$\sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$$

$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2}$$

$$\cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$$

### **Vectors**

The resolved part of **a** in the direction of **b** is  $\frac{\mathbf{a.b}}{|\mathbf{b}|}$ 

The point dividing AB in the ratio  $\lambda : \mu$  is  $\frac{\mu \mathbf{a} + \lambda \mathbf{b}}{\lambda + \mu}$ 

$$\text{Vector product: } \mathbf{a} \times \mathbf{b} = |\mathbf{a}| \, |\mathbf{b}| \sin \theta \, \hat{\mathbf{n}} = \begin{vmatrix} \mathbf{i} & a_1 & b_1 \\ \mathbf{j} & a_2 & b_2 \\ \mathbf{k} & a_3 & b_3 \end{vmatrix} = \begin{pmatrix} a_2b_3 - a_3b_2 \\ a_3b_1 - a_1b_3 \\ a_1b_2 - a_2b_1 \end{pmatrix}$$

If A is the point with position vector  $\mathbf{a} = a_1 \mathbf{i} + a_2 \mathbf{j} + a_3 \mathbf{k}$  and the direction vector  $\mathbf{b}$  is given by

 $\mathbf{b} = b_1 \mathbf{i} + b_2 \mathbf{j} + b_3 \mathbf{k}$ , then the straight line through A with direction vector  $\mathbf{b}$  has cartesian equation  $\frac{x - a_1}{b_1} = \frac{y - a_2}{b_2} = \frac{z - a_3}{b_3} \ (= \lambda)$ 

The plane through A with normal vector  $\mathbf{n} = n_1 \mathbf{i} + n_2 \mathbf{j} + n_3 \mathbf{k}$  has cartesian equation

$$n_1 x + n_2 y + n_3 z + d = 0$$
, where  $d = -\mathbf{a.n}$ 

The plane through non-collinear points A, B and C has vector equation

$$\mathbf{r} = \mathbf{a} + \lambda(\mathbf{b} - \mathbf{a}) + \mu(\mathbf{c} - \mathbf{a}) = (1 - \lambda - \mu)\mathbf{a} + \lambda\mathbf{b} + \mu\mathbf{c}$$

The plane through the point with position vector **a** and parallel to **b** and **c** has equation  $\mathbf{r} = \mathbf{a} + s\mathbf{b} + t\mathbf{c}$ 

The perpendicular distance of 
$$(\alpha, \beta, \gamma)$$
 from  $n_1x + n_2y + n_3z + d = 0$  is  $\frac{\left|n_1\alpha + n_2\beta + n_3\gamma + d\right|}{\sqrt{(n_1^2 + n_2^2 + n_3^2)}}$ 

### Matrix transformations

Anticlockwise rotation through  $\theta$  about O:  $\begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix}$ Reflection in the line  $y = (\tan \theta)x$ :  $\begin{pmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & -\cos 2\theta \end{pmatrix}$ 

Reflection in the line 
$$y = (\tan \theta)x$$
:  $\begin{pmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & -\cos 2\theta \end{pmatrix}$ 

### Differentiation

$$f(x) f'(x)$$

$$tan kx k sec2 kx$$

$$sin-1 x \frac{1}{\sqrt{(1-x^2)}}$$

$$cos-1 x -\frac{1}{\sqrt{(1-x^2)}}$$

$$tan-1 x \frac{1}{1+x^2}$$

$$sec x sec x tan x$$

$$cot x -cosec2 x$$

$$cosec x -cosec x cot x$$

$$sinh x cosh x$$

$$tanh x sech2 x$$

$$sinh-1 x \frac{1}{\sqrt{(1+x^2)}}$$

$$cosh-1 x \frac{1}{\sqrt{(x^2-1)}}$$

$$tanh-1 x \frac{1}{1-x^2}$$

**Integration** ( + constant; a > 0 where relevant)

$$f(x) \qquad \int f(x) dx$$

$$\sec^2 kx \qquad \frac{1}{k} \tan kx$$

$$\tan x \qquad \ln |\sec x|$$

$$\csc x \qquad \ln |\sin x|$$

$$\csc x \qquad \ln |\sec x + \cot x| = \ln |\tan \frac{1}{2}x|$$

$$\sec x \qquad \ln |\sec x + \tan x| = \ln |\tan (\frac{1}{2}x + \frac{1}{4}\pi)|$$

$$\sinh x \qquad \cosh x$$

$$\cosh x \qquad \sinh x$$

$$\tanh x \qquad \ln \cosh x$$

$$\frac{1}{\sqrt{a^2 - x^2}} \qquad \frac{1}{a^2 + x^2} \qquad \frac{1}{a} \tan^{-1} (\frac{x}{a}) \qquad (|x| < a)$$

$$\frac{1}{\sqrt{(a^2 - a^2)}} \qquad \cosh^{-1} (\frac{x}{a}) \qquad \text{or } \ln\{x + \sqrt{(x^2 - a^2)}\} \qquad (x > a)$$

$$\frac{1}{\sqrt{(a^2 + x^2)}} \qquad \sinh^{-1} (\frac{x}{a}) \qquad \text{or } \ln\{x + \sqrt{(x^2 + a^2)}\}$$

$$\frac{1}{a^2 - x^2} \qquad \frac{1}{2a} \ln \left|\frac{a + x}{a - x}\right| = \frac{1}{a} \tanh^{-1} (\frac{x}{a}) \qquad (|x| < a)$$

$$\frac{1}{x^2 - a^2} \qquad \frac{1}{2a} \ln \left|\frac{x - a}{x + a}\right|$$

$$\int u \frac{dv}{dx} dx = uv - \int v \frac{du}{dx} dx$$

# Area of a sector

$$A = \frac{1}{2} \int r^2 d\theta \quad \text{(polar coordinates)}$$

$$A = \frac{1}{2} \int \left( x \frac{dy}{dt} - y \frac{dx}{dt} \right) dt \quad \text{(parametric form)}$$

### **Numerical Mathematics**

# Numerical integration

The trapezium rule: 
$$\int_{a}^{b} y \, dx \approx \frac{1}{2} h\{(y_0 + y_n) + 2(y_1 + y_2 + \dots + y_{n-1})\}, \text{ where } h = \frac{b - a}{n}$$
 Simpson's Rule: 
$$\int_{a}^{b} y \, dx \approx \frac{1}{3} h\{(y_0 + y_n) + 4(y_1 + y_3 + \dots + y_{n-1}) + 2(y_2 + y_4 + \dots + y_{n-2})\},$$
 where  $h = \frac{b - a}{n}$  and  $n$  is even

# Numerical Solution of Equations

The Newton-Raphson iteration for solving 
$$f(x) = 0$$
:  $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ 

# **Mechanics**

### Motion in a circle

Transverse velocity:  $v = r\dot{\theta}$ 

Transverse acceleration:  $\dot{v} = r\ddot{\theta}$ 

Radial acceleration:  $-r\dot{\theta}^2 = -\frac{v^2}{r}$ 

# Centres of Mass (for uniform bodies)

Triangular lamina:  $\frac{2}{3}$  along median from vertex

Solid hemisphere, radius r:  $\frac{3}{8}r$  from centre

Hemispherical shell, radius r:  $\frac{1}{2}r$  from centre

Circular arc, radius r, angle at centre  $2\alpha$ :  $\frac{r \sin \alpha}{\alpha}$  from centre

Sector of circle, radius r, angle at centre  $2\alpha$ :  $\frac{2r\sin\alpha}{3\alpha}$  from centre

Solid cone or pyramid of height h:  $\frac{1}{4}h$  above the base on the line from centre of base to vertex

Conical shell of height  $h: \frac{1}{3}h$  above the base on the line from centre of base to vertex

# *Moments of Inertia* (for uniform bodies of mass *m*)

Thin rod, length 2l, about perpendicular axis through centre:  $\frac{1}{3}ml^2$ 

Rectangular lamina about axis in plane bisecting edges of length 2l:  $\frac{1}{3}ml^2$ 

Thin rod, length 2l, about perpendicular axis through end:  $\frac{4}{3}ml^2$ 

Rectangular lamina about edge perpendicular to edges of length 2l:  $\frac{4}{3}ml^2$ 

Rectangular lamina, sides 2a and 2b, about perpendicular axis through centre:  $\frac{1}{3}m(a^2+b^2)$ 

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Hoop or cylindrical shell of radius r about axis:  $mr^2$ 

Hoop of radius r about a diameter:  $\frac{1}{2}mr^2$ 

Disc or solid cylinder of radius r about axis:  $\frac{1}{2}mr^2$ 

Disc of radius r about a diameter:  $\frac{1}{4}mr^2$ 

Solid sphere, radius r, about diameter:  $\frac{2}{5}mr^2$ 

Spherical shell of radius r about a diameter:  $\frac{2}{3}mr^2$ 

Parallel axes theorem:  $I_A = I_G + m(AG)^2$ 

Perpendicular axes theorem:  $I_z = I_x + I_y$  (for a lamina in the x-y plane)

# **Probability & Statistics**

# Probability

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cap B) = P(A)P(B \mid A)$$

$$P(A \mid B) = \frac{P(B \mid A)P(A)}{P(B \mid A)P(A) + P(B \mid A')P(A')}$$
Bayes' Theorem: 
$$P(A_j \mid B) = \frac{P(A_j)P(B \mid A_j)}{\Sigma P(A_j)P(B \mid A_j)}$$

### Discrete distributions

For a discrete random variable X taking values  $x_i$  with probabilities  $p_i$ 

Expectation (mean):  $E(X) = \mu = \sum x_i p_i$ 

Variance:  $Var(X) = \sigma^2 = \Sigma (x_i - \mu)^2 p_i = \Sigma x_i^2 p_i - \mu^2$ 

For a function g(X):  $E(g(X)) = \sum g(x_i)p_i$ 

The probability generating function of *X* is  $G_X(t) = E(t^X)$ , and

$$\mathrm{E}(X) = \mathrm{G}_X'(1)$$

$$Var(X) = G_X''(1) + G_X'(1) - \{G_X'(1)\}^2$$

For Z = X + Y, where X and Y are independent:  $G_Z(t) = G_X(t)G_Y(t)$ 

### Standard discrete distributions

| Distribution of <i>X</i>      | P(X=x)                              | Mean          | Variance          | P.G.F.                |
|-------------------------------|-------------------------------------|---------------|-------------------|-----------------------|
| Binomial $B(n, p)$            | $\binom{n}{x} p^x (1-p)^{n-x}$      | np            | np(1-p)           | $(1-p+pt)^n$          |
| Poisson $Po(\lambda)$         | $e^{-\lambda} \frac{\lambda^x}{x!}$ | λ             | λ                 | $e^{\lambda(t-1)}$    |
| Geometric $Geo(p)$ on $1, 2,$ | $p(1-p)^{x-1}$                      | $\frac{1}{p}$ | $\frac{1-p}{p^2}$ | $\frac{pt}{1-(1-p)t}$ |

### Continuous distributions

For a continuous random variable X having probability density function f

Expectation (mean): 
$$E(X) = \mu = \int xf(x) dx$$

Variance: 
$$Var(X) = \sigma^2 = \int (x - \mu)^2 f(x) dx = \int x^2 f(x) dx - \mu^2$$

For a function 
$$g(X)$$
:  $E(g(X)) = \int g(x)f(x) dx$ 

Cumulative distribution function:  $F(x) = P(X \le x) = \int_{0.05}^{x} f(t) dt$ 

The moment generating function of *X* is  $M_X(t) = E(e^{tX})$  and

$$E(X) = M_X'(0)$$

$$\mathrm{E}(\boldsymbol{X}^n) = \mathrm{M}_{\boldsymbol{X}}^{(n)}(0)$$

$$Var(X) = M_X''(0) - \{M_X'(0)\}^2$$

For Z = X + Y, where X and Y are independent:  $M_Z(t) = M_X(t)M_Y(t)$ 

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### Standard continuous distributions

| Distribution of <i>X</i>        | P.D.F.   | Mean                | Variance              | M.G.F.   |
|---------------------------------|--|---------------------|-----------------------|--|
| Uniform (Rectangular) on [a, b] | $\frac{1}{b-a}$  | $\frac{1}{2}(a+b)$  | $\frac{1}{12}(b-a)^2$ | $\frac{\mathrm{e}^{bt} - \mathrm{e}^{at}}{(b-a)t}$ |
| Exponential                     | $\lambda e^{-\lambda x}$   | $\frac{1}{\lambda}$ | $\frac{1}{\lambda^2}$ | $\frac{\lambda}{\lambda - t}$                      |
| Normal N( $\mu$ , $\sigma^2$ )  | $\frac{1}{\sigma\sqrt{(2\pi)}}e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$ | μ                   | $\sigma^2$            | $e^{\mu t + \frac{1}{2}\sigma^2 t^2}$              |

### Expectation algebra

Covariance: 
$$Cov(X, Y) = E((X - \mu_X)(Y - \mu_Y)) = E(XY) - \mu_X \mu_Y$$

$$Var(aX \pm bY) = a^2 Var(X) + b^2 Var(Y) \pm 2ab Cov(X, Y)$$

Product moment correlation coefficient: 
$$\rho = \frac{\text{Cov}(X, Y)}{\sigma_X \sigma_Y}$$

If 
$$X = aX' + b$$
 and  $Y = cY' + d$ , then  $Cov(X, Y) = ac Cov(X', Y')$ 

For independent random variables X and Y

$$E(XY) = E(X)E(Y)$$

$$Var(aX \pm bY) = a^{2} Var(X) + b^{2} Var(Y)$$

### Sampling distributions

For a random sample  $X_1, X_2, \ldots, X_n$  of n independent observations from a distribution having mean  $\mu$  and variance  $\sigma^2$ 

$$\overline{X}$$
 is an unbiased estimator of  $\mu$ , with  $Var(\overline{X}) = \frac{\sigma^2}{n}$ 

$$S^2$$
 is an unbiased estimator of  $\sigma^2$ , where  $S^2 = \frac{\sum (X_i - \overline{X})^2}{n-1}$ 

For a random sample of *n* observations from  $N(\mu, \sigma^2)$ 

$$\frac{\overline{X} - \mu}{\sigma/\sqrt{n}} \sim N(0, 1)$$

$$\frac{\overline{X} - \mu}{S/\sqrt{n}} \sim t_{n-1}$$
 (also valid in matched-pairs situations)

If *X* is the observed number of successes in *n* independent Bernoulli trials in each of which the probability of success is *p*, and  $Y = \frac{X}{n}$ , then

$$E(Y) = p$$
 and  $Var(Y) = \frac{p(1-p)}{n}$ 

For a random sample of  $n_x$  observations from  $N(\mu_x, \sigma_x^2)$  and, independently, a random sample of  $n_y$  observations from  $N(\mu_y, \sigma_y^2)$ 

$$\frac{(\overline{X} - \overline{Y}) - (\mu_x - \mu_y)}{\sqrt{\left(\frac{\sigma_x^2}{n_x} + \frac{\sigma_y^2}{n_y}\right)}} \sim N(0, 1)$$

If 
$$\sigma_x^2 = \sigma_y^2 = \sigma^2$$
 (unknown) then 
$$\frac{(\overline{X} - \overline{Y}) - (\mu_x - \mu_y)}{\sqrt{\left\{S_p^2 \left(\frac{1}{n_x} + \frac{1}{n_y}\right)\right\}}} \sim t_{n_x + n_y - 2},$$

where 
$$S_p^2 = \frac{(n_x - 1)S_x^2 + (n_y - 1)S_y^2}{n_x + n_y - 2}$$

### Correlation and regression

For a set of *n* pairs of values  $(x_i, y_i)$ 

$$S_{xx} = \Sigma (x_i - \bar{x})^2 = \Sigma x_i^2 - \frac{(\Sigma x_i)^2}{n}$$

$$S_{yy} = \Sigma (y_i - \bar{y})^2 = \Sigma y_i^2 - \frac{(\Sigma y_i)^2}{n}$$

$$S_{xy} = \Sigma (x_i - \bar{x})(y_i - \bar{y}) = \Sigma x_i y_i - \frac{(\Sigma x_i)(\Sigma y_i)}{n}$$

The product moment correlation coefficient is

$$r = \frac{S_{xy}}{\sqrt{(S_{xx}S_{yy})}} = \frac{\Sigma(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\{(\Sigma(x_i - \bar{x})^2)(\Sigma(y_i - \bar{y})^2)\}}} = \frac{\Sigma x_i y_i - \frac{(\Sigma x_i)(\Sigma y_i)}{n}}{\sqrt{\{(\Sigma x_i^2 - \frac{(\Sigma x_i)^2}{n})(\Sigma y_i^2 - \frac{(\Sigma y_i)^2}{n})\}}}$$

Spearman's rank correlation coefficient is  $r_s = 1 - \frac{6\Sigma d^2}{n(n^2 - 1)}$ 

The regression coefficient of y on x is  $b = \frac{S_{xy}}{S_{xx}} = \frac{\Sigma(x_i - \overline{x})(y_i - \overline{y})}{\Sigma(x_i - \overline{x})^2}$ 

Least squares regression line of y on x is y = a + bx where  $a = \overline{y} - b\overline{x}$ 

### Distribution-free (non-parametric) tests

Goodness-of-fit test and contingency tables: 
$$\sum \frac{(O_i - E_i)^2}{E_i} \sim \chi_v^2$$

Approximate distributions for large samples

Wilcoxon Signed Rank test:  $T \sim N(\frac{1}{4}n(n+1), \frac{1}{24}n(n+1)(2n+1))$ 

Wilcoxon Rank Sum test (samples of sizes m and n, with  $m \le n$ ):

$$W \sim N(\frac{1}{2}m(m+n+1), \frac{1}{12}mn(m+n+1))$$

|       |  | 0   | 0  | 7  | 9  | 7  | 0   |
|-------|--|---|--|--|--|--|---|
|       | 0.95   | 0.000   | 0.000  | 0.001  | 0.022  | 0.226  | 1.000   |
|       | 6.0  | 0000'(  | 0.0005   | 9800.0   | 0.0815   | .4095  | 0000  |
|       | 0.85   | 0.0001  | 0.0022   | 0.0266   | .1648 (  | .5563 (  | .0000   |
|       | 9/9  | 0.0001  | 0.0033   | 0.0355   | .1962 (  | .5981  | .0000   |
|       | 8.0  | 0.0003  | 0.0067   | 0.0579   | 0.2627   | 0.6723   | .0000   |
|       | 0.75   | 0.0010  | 0.0156   | ).1035 (   | 3672 (   | ).7627 (   | 1.0000  |
|       | 0.7  | 0.0024  | 0.0308   | ).1631 (   | 3.4718 (   | ).8319 (   | 1.0000  |
|       | 2/3  | 0.0041  | 0.0453 (   | 0.2099 (   | ).5391 (   | ).8683 (   | 1.0000  |
|       | 0.35  0.4  0.45  0.5  0.55  0.6  0.65  2/3  0.7  0.75  0.8  5/6  0.85  0.9  0.95 | 0.0053  | 0.0540   | 0.2352   | 0.5716   | 0.8840   | 1.0000  |
|       | 9.0  | 0.0102  | 0.0870   | 0.3174   | 0.6630   | 0.9222   | 1.0000  |
|       | 0.55   | 0.0185  | 0.1312   | 0.4069   | 0.7438   | 0.9497   | 1.0000  |
|       | 0.5  | 0.0313  | 0.1875   | 0.5000   | 0.8125   | 0.9688   | 1.0000  |
|       | 0.45   | 0.0503  | 0.2562   | 0.5931   | 0.8688   | 0.9815   | 1.0000  |
|       | 0.4  | 0.0778  | 0.3370   | 0.6826   | 0.9130   | 0.9898   | 1.0000  |
|       | 0.35   | 0.1160  | 0.4284   | 0.7648   | 0.9460   | 0.9947   | 1.0000  |
|       | 1/3  | 0.1317  | 0.4609   | 0.7901   | 0.9547   | 0.9959   | 1.0000  |
|       | 0.3  | 0.1681  | 0.5282   | 0.8369   | 0.9692   | 0.9976   | 1.0000  |
|       | 0.25   | 0.2373  | 0.6328   | 0.8965   | 0.9844   | 0.9990   | 1.0000  |
|       | 0.2  | 0.3277  | 0.7373   | 0.9421   | 0.9933   | 0.9997   | 00000   |
|       | 1/6  | 0.4019  | 0.8038   | 0.9645   | : 0.9967   | 0.9999   | 00000   |
|       | 0.15   | 0.4437  | 0.8352   | 0.9734   | 0.9978   | 0.9999   | 00000   |
|       | 0.1  | 3 0.5905  | 1 0.9185   | 3 0.9914   | 3 0.9995   | ) 1.0000   | ) 1.0000  |
|       | 0.05 0.1 0.15 1/6 0.2 0.25 0.3 1/3   | x = 0   0.7738 0.5905 0.4437 0.4019 0.3277 0.2373 0.1681 0.1317 0.1160 0.0778 0.0503 0.0313 0.0185 0.0102 0.0053 0.0041 0.0024 0.0010 0.0003 0.0001 0.0001 0.0000 0.0000 0.0000 | 0.9774 0.9185 0.8352 0.8038 0.7373 0.6328 0.5282 0.4609 0.4284 0.3370 0.2562 0.1875 0.1312 0.0870 0.0540 0.0453 0.0308 0.0156 0.0067 0.0033 0.0022 0.0005 0.0000 | 2 0.9988 0.9914 0.9734 0.9645 0.9421 0.8965 0.8369 0.7901 0.7648 0.6826 0.5931 0.5000 0.4069 0.3174 0.2352 0.2099 0.1631 0.1035 0.0579 0.0355 0.0266 0.0086 0.0012 | 3   1.0000 0.9995 0.9978 0.9967 0.9933 0.9844 0.9692 0.9547 0.9460 0.9130 0.8688 0.8125 0.7438 0.6630 0.5716 0.5391 0.4718 0.3672 0.2627 0.1962 0.1648 0.0815 0.0226 | 4   1.0000 1.0000 0.9999 0.9999 0.9997 0.9990 0.9976 0.9959 0.9947 0.9898 0.9815 0.9688 0.9497 0.9222 0.8840 0.8683 0.8319 0.7627 0.6723 0.5981 0.5563 0.4095 0.2262 | 1,0000 1,0 |
| n = 5 | D  | x = 0   | 1  | 2  | 3  | 4  | 5   |
|       |  |   |  |  |  |  |   |

|       | .95  | 0000  | 0000  | 1001   | 022  | 328   | .649   | 0000  |
|-------|--|---|---|--|--|---|--|---|
|       | 0.   | 0.0   | 1 0.0   | 3 0.0  | 9.06   | 3 0.0   | 6 0.2  | 0.1.0   |
|       | 0.9  | 000.0   | 000.0   | 0.000  | 0.015  | 0.114   | 0.468  | 1.000   |
|       | .85  | 0000  | 004 (   | 059 (  | 473 (  | ,235 (  | 5229 (   | , 0000  |
|       | i 0.   | )0 O.C  | 77 0.0  | 37 0.0   | 33 O.C   | 32 0.2  | ₹1 0.¢   | <b>30</b> 1.C   |
|       | 5/6  | 0.000   | 0.000   | 0.00   | 0.06   | 0.26  | 0.665  | 1.000   |
|       | 8.0  | 00001   | 0.0016  | 0.0170   | 0860.  | 3446  | 1.7379   | 0000.   |
|       | 7.75   | 0002 C  | 0046 C  | 0376 C   | 1694 C   | 4661 C  | 8220 C   | 0000  |
|       | 0.35  0.4  0.45  0.5  0.55  0.6  0.65  2/3  0.7  0.75  0.8  5/6  0.85  0.9  0.95 | 0007 0.   | 109 0.  | 705 0.   | 557 0.   | 798 0.  | 824 0.   | 000 1.  |
|       | 3 0  | 14 0.0  | 78 0.0  | 0.0 10.0   | 96 0.2   | 88 0.5  | 220.8  | 00 1.0  |
|       | 2/.  | 3 0.00  | 3 0.01  | 10.10  | 9 0.31   | 9 0.64  | 5 0.91   | 0.11  |
|       | 0.65   | 0.0018  | 0.0223  | 0.1174   | 0.3529   | 0.6809  | $0.924\epsilon$  | 1.000C  |
|       | 9.0  | 0041  | 0410 (  | 1792 (   | 4557 (   | 1992  | 9533   | 0000  |
|       | 55   | 083 0.  | 592 0.  | 553 0.   | 585 0.   | 364 0.  | 723 0.   | 000 1.  |
|       | 0  | 0.09  | 4 0.00  | 8 0.2.   | 3 0.5.   | 6 0.8   | 4 0.9  | 0 1.00  |
|       | 0.5  | 0.015   | 0.109   | 0.343  | 0.656  | 0.890   | 0.984  | 1.000   |
|       | 0.45   | 0.0277  | 9.1636  | 0.4415   | 0.7447   | 9.9308  | 7.9917   | 1.0000  |
|       | 0.4  | .0467   | .2333 (   | .5443 (  | .8208  | .9590   | 9959   | .0000   |
|       | 35   | 754 0   | 191 0   | 471 0  | 826 0.   | .0 777  | 982 0  | 1000  |
|       |  | 78 0.0  | 12 0.3  | 04 0.6   | 99 0.8   | 22 0.9  | 86 0.9   | 00 1.0  |
|       | 1/.  | 5 0.08  | 2 0.35  | 3 0.68   | 5 0.89   | 1 0.98.   | 3 0.99   | 0.1100  |
|       | 0.3  | $0.117\epsilon$   | 0.4202  | 0.744  | 0.9295   | 0.989   | 0.999  | 1.0000  |
|       | 0.25   | 0.1780  | 1.5339  | ).8306   | ).9624   | ).9954  | 3666.  | 0000  |
|       | 0.2  | 2621 (  | 6554 (  | 9011 (   | 9830 (   | 9984 (  | ) 6666   | 0000  |
|       | 0.05 0.1 0.15 1/6 0.2 0.25 0.3 1/3   | x = 0 0.7351 0.5314 0.3771 0.3349 0.2621 0.1780 0.1176 0.0878 0.0754 0.0467 0.0277 0.0156 0.0083 0.0041 0.0018 0.0014 0.0007 0.0002 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 | 0.9672 0.8857 0.7765 0.7368 0.6554 0.5339 0.4202 0.3512 0.3191 0.2333 0.1636 0.1094 0.0692 0.0410 0.0223 0.0178 0.0109 0.0046 0.0016 0.0007 0.0004 0.0001 0.0000 0.0000 | 2   0.9978 0.9842 0.9527 0.9377 0.9011 0.8306 0.7443 0.6804 0.6471 0.5443 0.4415 0.3438 0.2553 0.1792 0.1174 0.1001 0.0705 0.0376 0.0170 0.0087 0.0059 0.0013 0.0001 | 3   0.9999 0.9987 0.9941 0.9913 0.9830 0.9624 0.9295 0.8999 0.8826 0.8208 0.7447 0.6563 0.5585 0.4557 0.3529 0.3196 0.2557 0.1694 0.0989 0.0623 0.0473 0.0159 0.0022 | 4   1.0000 0.9999 0.9996 0.9993 0.9984 0.9954 0.9891 0.9822 0.9777 0.9590 0.9308 0.8364 0.7667 0.6809 0.6488 0.5798 0.4661 0.3446 0.2632 0.2235 0.1143 0.0328 | 5   1.0000 1.0000 1.0000 1.0000 0.9999 0.9998 0.9993 0.9986 0.9982 0.9959 0.9917 0.9844 0.9723 0.9533 0.9246 0.9122 0.8824 0.8220 0.7379 0.6651 0.6229 0.4686 0.2649 | 6 1.0000 1 |
|       | 15 1   | 771 0.3   | 765 0.7   | 527 0.5  | 341 0.5  | 30 96€  | <u>)00 1.C</u>   | 000 1.0   |
|       | 0.1  | 14 0.37   | 57 0.77   | 12 0.95  | 37 0.99  | <b>36.0 6</b> €   | 00 1.0C  | )0 1.0C   |
|       | 0.1  | 0.531   | 2 0.885   | 3 0.984  | 366.0 €  | ) 0.999   | ) 1.00(  | ) 1.000   |
|       | 0.05   | 0.7351  | 0.9672  | 3766.0   | 0.9995   | 1.0000  | 1.000C   | 1.0000  |
| 9 = u | D  | $\epsilon = 0$  | 1   | 2  | 3  | 4   | 5  | 9   |
| 7.    |  | ۲   |   |  |  |   | <u> </u>   |   |

| 0.15 1/<br>3206 0.27/<br>7166 0 66   | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | 35 0.3<br>35 0.0824 (   | $\frac{1/3}{0.05850}$ | 0.35      | 0.4 0<br>.0280 0.0 | 0.45 0.0<br>0.152 0.00<br>1024 0.06 | 0.35 0.4 0.45 0.5 0.55 0.6 0.65 2/3 0.7 0.75 0.8 5/6 0.85 0.9 0.95 0.0490 0.0280 0.0152 0.0078 0.0016 0.0016 0.0005 0.0002 0.0001 0.0000 0.000 | 0.6<br>7 0.0016<br>7 0.0188 | 5 0.0006 | 2/3<br>0.0005 C | 0.7      | 0.75                 | 0.8       | 5/6 0.<br>0000 0.0   | 85 0.9<br>000 0.00<br>001 0 00 | 0.95                 |
|--|--|---|-----------------------|-----------|--------------------|-------------------------------------|--|-----------------------------|----------|-----------------|----------|----------------------|-----------|----------------------|--------------------------------|----------------------|
| 042 0.8520   | 0.75   | 2 0.9962 0.9743 0.9262 0.9042 0.88520 0.7564 0.6471 0.5706 0.5323 0.4199 0.3164 0.2266 0.1529 0.0963 0.0556 0.0453 0.0288 0.0129 0.0047 0.0020 0.00012 0.0002 0.000000000000000 | 0.5706 0              | ).5323 0. | .4199 0.2          | 3164 0.22                           | 366 0.152  | 9 0.0963                    | 3 0.0556 | 0.0453 (        | 0.0288 0 | .0129 0.             | 0047 0.   | 0020 0.0             | 012 0.00                       | 02 0.000             |
| 4 [1.0000 0.9998 0.9988 0.9980 0.9953 0.9871 0.9712 0.9547 0.9444 0.9037 0.8471 0.7734 0.6836 0.5801 0.4677 0.4294 0.3529 0.2436 0.1480 0.0958 0.0738 0.0257 0.0038  | √ ∞ l  | 71 0.9712 (   | ).9547 0              | ).9444 0. | .9037 0.8          | 8471 0.77                           | 734 0.683  | 6 0.5801                    | 0.4677   | 0.4294 (        | 3529 0   | .0700 0.<br>.2436 0. | .1480 0.  | 0.0 8560<br>0958 0.0 | 738 0.02                       | 27 0.003<br>57 0.003 |
| 1.0000 1.0000 0.9999 0.9999 0.9996 0.9987 0.9962 0.9931 0.9910 0.9912 0.9643 0.9375 0.8976 0.8414 0.7662 0.7366 0.6706 0.5551 0.4233 0.3302 0.2834 0.1497 0.0444   | ζV (   | 187 0.9962 (  | 0.9931 0              | 0.9910 0. | .9812 0.9          | 9643 0.93                           | 75 0.897   | 6 0.8414                    | 4 0.7662 | 0.7366          | 0.6706 0 | .5551 0.             | 4233 0.   | 3302 0.2             | 834 0.14                       | 97 0.044             |
| 6   1.0000 1.0000 1.0000 1.0000 0.3939 0.3938 0.3934 0.3984 0.3985 0.3952 0.3888 0.3720 0.3510 0.3413 0.3176 0.8663 0.7903 0.7209 0.6794 0.3217 0.3017 0.5017 0.3017 0.000 1.0000 |  | 99 0.9998 (   | J 5888.U              | 1.9994 U. | .9984 0.           | 2903 0.95                           | 722 U.984  | 8 0.9720<br>0 1 0000        | 0.0510   | 0.9415 (        | 0.9176.0 | .8665 U.             | . /903 U. | 7209 0.6             | 794 0.52                       | 17 0.301             |

| n = 8 |   |        |        |        |        |        |          |          |         |         |            |          |          |          |         |         |            |            |           |           |  |        |         |
|-------|---|--------|--------|--------|--------|--------|----------|----------|---------|---------|------------|----------|----------|----------|---------|---------|------------|------------|-----------|-----------|--|--------|---------|
| d     | <i>p</i>   0.05 0.1 0.15 1/6 0.2 0.25 0.3 1/3   | 0.1    | 0.15   | 1/6    | 0.2    | 0.25   | 0.3      | 1/3      |         | 5 0.4   | 0.4        | 5 0.5    | 0.5      | 5 0.6    | 9.0     | 5 2/.   | 3 0.7      | 7 0.7      | 5 0.8     | 9/9       | 0.35  0.4  0.45  0.5  0.55  0.6  0.65  2/3  0.7  0.75  0.8  5/6  0.85  0.9  0.95 | 6.0    | 0.95    |
| x = 0 | x = 0   0.6634 0.4305 0.2725 0.2326 0.1678 0.1001 0.0576 0.0390 0.0319 0.0168 0.0084 0.0039 0.0017 0.0007 0.0002 0.0002 0.0002 0.0001 0.0000 0.000     | 0.4305 | 0.2725 | 0.2326 | 0.1678 | 0.1001 | 0.057    | 5 0.039  | 0 0.03  | 19 0.01 | $58\ 0.00$ | 84 0.00  | 39 0.00  | 17 0.00  | 070.00  | 02 0.00 | $02\ 0.00$ | $01\ 0.00$ | <u> </u>  | 000.000   | 0000'0 C   | 0.0000 | 0.000.0 |
| 1     | 0.9428 0.8131 0.6572 0.6047 0.5033 0.3671 0.2553 0.1951 0.1691 0.1064 0.0632 0.0352 0.0181 0.0085 0.0036 0.0026 0.0013 0.0004 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000   | 0.8131 | 0.6572 | 0.6047 | 0.5033 | 0.3671 | 0.255    | 3 0.195  | 1 0.169 | 91 0.10 | 54 0.06    | 32 0.03: | 52 0.018 | 31 0.008 | 85 0.00 | 36 0.00 | 26 0.00    | 13 0.000   | 34 0.000  | 0.0000    | 000000   | 0.0000 | 0.0000  |
| 2     | 2   0.9942 0.9619 0.8948 0.8652 0.7969 0.6785 0.5518 0.4682 0.4278 0.3154 0.2201 0.1445 0.0885 0.0498 0.0253 0.0197 0.0113 0.0042 0.0012 0.0004 0.0002 0.0000 0.0000  | 0.9619 | 0.8948 | 0.8652 | 0.7969 | 0.6785 | 5 0.5518 | 3 0.468  | 2 0.42  | 78 0.31 | 54 0.220   | 010.14   | 45 0.08  | 35 0.04  | 98 0.02 | 53 0.01 | 97 0.01    | 13 0.002   | 12 0.001  | 2 0.000   | 4 0.0002   | 0.0000 | 0.000.0 |
| Э     | 3   0.9996 0.9950 0.9786 0.9693 0.9437 0.8862 0.8059 0.7414 0.7064 0.5941 0.4770 0.3633 0.2604 0.1737 0.1061 0.0879 0.0580 0.0273 0.0104 0.0046 0.0029 0.0004 0.0000  | 0.9950 | 0.9786 | 0.9693 | 0.9437 | 0.8862 | 9308.0   | 9 0.741. | 4 0.700 | 94 0.59 | 41 0.47    | 70 0.36. | 33 0.260 | 24 0.17. | 37 0.10 | 61 0.08 | 79 0.05    | 80 0.02    | 73 0.010  | 0.004     | 5 0.0029   | 0.0004 | 0.000.0 |
| 4     | $4 \left  1.0000\ 0.9996\ 0.9971\ 0.9954\ 0.9954\ 0.9896\ 0.9727\ 0.9420\ 0.9121\ 0.8939\ 0.8263\ 0.7396\ 0.6367\ 0.5230\ 0.4059\ 0.2936\ 0.2936\ 0.2586\ 0.1941\ 0.1138\ 0.0563\ 0.0307\ 0.0214\ 0.0050\ 0.0004$   | 0.9996 | 0.9971 | 0.9954 | 0.9896 | 0.9727 | 7 0.9420 | 0.912    | 1 0.89. | 39 0.82 | 63 0.73    | 96 0.630 | 67 0.52. | 30 0.40; | 59 0.29 | 36 0.25 | 86 0.19    | 41 0.11.   | 38 0.056  | 3 0.030   | 7 0.0214   | 0.0050 | 0.0004  |
| 5     | 5   1.0000 1.0000 0.9998 0.9988 0.9988 0.9988 0.9988 0.9887 0.9803 0.9747 0.9502 0.9115 0.8555 0.7799 0.6846 0.5722 0.5318 0.4482 0.3215 0.2031 0.1348 0.1052 0.0381 0.0058   | 1.0000 | 8666.0 | 9666.0 | 0.9988 | 0.9958 | 3 0.9887 | 7 0.980  | 3 0.97  | 47 0.95 | 02 0.91    | 15 0.85. | 55 0.77  | 39 0.68  | 46 0.57 | 22 0.53 | 18 0.44    | 82 0.32    | 150.203   | 1 0.134   | 8 0.1052   | 0.0381 | 0.0058  |
| 9     | 6   1.0000 1.0000 1.0000 1.0000 0.9999 0.9996 0.9987 0.9974 0.9964 0.9915 0.9819 0.9648 0.9368 0.836 0.8369 0.8049 0.7447 0.6329 0.4967 0.3953 0.3428 0.1869 0.0572   | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9996 | , 0.9987 | 7 0.997  | 4 0.990 | 54 0.99 | 15 0.98    | 19 0.96  | 48 0.930 | 58 0.89  | 36 0.83 | 08.060  | 49 0.74    | 47 0.632   | 29 0.496  | 57 0.395  | 3 0.3428   | 0.1869 | 0.0572  |
| 7     | 7   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9999 0.9998 0.9998 0.9993 0.9983 0.9961 0.9916 0.9832 0.9681 0.9610 0.9424 0.8999 0.8322 0.7674 0.7275 0.5695 0.3366  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.000C | 9666.0 ( | 9666.0   | 8 0.99  | 98 0.99 | 93 0.998   | 83 0.990 | 61 0.99  | 16 0.98  | 32 0.96 | 81 0.96 | 10 0.94    | 24 0.899   | 99 0.832  | 2 0.767   | 4 0.7275   | 0.5695 | 0.3366  |
| ∞     | 8   1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 0001     | 0 1.000 | 00.1.00 | 00 1.000   | 00 1.00t | 00 1.000 | 00.1.00  | 00 1.00 | 00 1.00 | 00 1.00    | 00 1.000   | )00 1.00C | 00 1.0000 | 0.0000   | 1.0000 | 1.0000  |

| n = 9 |  |        |        |        |        |        |        |        |        |        |        |          |          |          |  |              |         |         |         |         |         |        |       |
|-------|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------|----------|----------|--|--------------|---------|---------|---------|---------|---------|--------|-------|
| d     | 0.05 0.1 0.15 1/6 0.2 0.25 0.3 1/3   | 0.1    | 0.15   | 1/6    | 0.2    | 0.25   | 0.3    | 1/3    | 0.35   | 0.4    | 0.45   | 0.5      | 0.55     | 9.0      | 0.35  0.4  0.45  0.5  0.55  0.6  0.65  2/3  0.7  0.75  0.8  5/6  0.85  0.9  0.95 | 2/3          | 0.7     | ).75    | 0.8     | 9/9     | 0.85    | 6.0    | 0.95  |
| x = 0 | x = 0   0.6302 0.3874 0.2316 0.1938 0.1342 0.0751 0.0404 0.0260 0.0207 0.0101 0.0046 0.0020 0.0008 0.0003 0.0001 0.0001 0.0000 0.000                  | 0.3874 | 0.2316 | 0.1938 | 0.1342 | 0.0751 | 0.0404 | 0.0260 | 0.0207 | 0.0101 | 0.0046 | 0.0020   | 0.0008 G | 0.0003 0 | 0.0001 0.  | $.0001 \ 0.$ | 00000   | 0000 0. | 0000    | 0 0000  | 00000   | 0 0000 | 0000  |
| 1     | 1 0.9288 0.7748 0.5995 0.5427 0.4362 0.3003 0.1960 0.1431 0.1211 0.0705 0.0385 0.0195 0.0091 0.0038 0.0014 0.0010 0.0004 0.0004 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   | 0.7748 | 0.5995 | 0.5427 | 0.4362 | 0.3003 | 0.1960 | 0.1431 | 0.1211 | 0.0705 | 0.0385 | 0.0195 ( | 0.0091   | 0.0038 0 | 0.0014 0.  | .00100.      | 0004 0. | 0001 0. | 0000    | 00000   | 00000   | 0 0000 | 0000  |
| 2     | 2   0.9916 0.9470 0.8591 0.8217 0.7382 0.6007 0.4628 0.3772 0.3373 0.2318 0.1495 0.0898 0.0498 0.0250 0.0112 0.0083 0.0043 0.0013 0.0003 0.0001 0.0000 0.0000 0.0000 0.0000  | 0.9470 | 0.8591 | 0.8217 | 0.7382 | 0.6007 | 0.4628 | 0.3772 | 0.3373 | 0.2318 | 0.1495 | 0.0898 ( | 0.0498 G | 0.0250 0 | 0.0112 0.  | .0083 0.     | 0043 0. | 0013 0. | 0003 0  | 00001 0 | 00000   | 0 0000 | 0000  |
| 3     | 3   0.9994 0.9917 0.9661 0.9520 0.9144 0.8343 0.7297 0.6503 0.6089 0.4826 0.3614 0.2539 0.1658 0.0994 0.0536 0.0424 0.0253 0.0100 0.0031 0.0011 0.0006 0.0001 0.0000   | 0.9917 | 0.9661 | 0.9520 | 0.9144 | 0.8343 | 0.7297 | 0.6503 | 0.6089 | 0.4826 | 0.3614 | 0.2539 ( | 0.1658 0 | 0.0994 0 | 0.0536 0.  | .0424 0.     | 0253 0. | 0100 0. | 0031 0. | .00110  | 0 9000. | 00001  | 0000  |
| 4     | $4 \left  1.0000\ 0.9991\ 0.9944\ 0.9910\ 0.9804\ 0.9910\ 0.9804\ 0.9511\ 0.9012\ 0.8552\ 0.8283\ 0.7334\ 0.6214\ 0.5000\ 0.3786\ 0.2666\ 0.1717\ 0.1448\ 0.0988\ 0.0489\ 0.0196\ 0.0090\ 0.0056\ 0.0009\ 0.0000$  | 0.9991 | 0.9944 | 0.9910 | 0.9804 | 0.9511 | 0.9012 | 0.8552 | 0.8283 | 0.7334 | 0.6214 | 0.5000 ( | 0.3786   | 0.2666   | 0.1717 0.  | .1448 0.     | .09880  | 0489 0. | 01960   | 0 0600  | .0056 0 | 0 6000 | 0000  |
| 5     | 5   1.0000 0.9999 0.9994 0.9989 0.9969 0.9969 0.9900 0.9747 0.9576 0.9464 0.9006 0.8342 0.7461 0.6386 0.5174 0.3911 0.3497 0.2703 0.1657 0.0856 0.0480 0.0339 0.0083 0.0006  | 0.9999 | 0.9994 | 0.9989 | 0.9969 | 0.9900 | 0.9747 | 0.9576 | 0.9464 | 9006.0 | 0.8342 | 0.7461   | 0.6386 C | 5174 0   | 3911 0   | .3497 0.     | 2703 0. | 1657 0. | 0856 0  | 04800   | .0333   | 0083 0 | 9000  |
| 9     | 6   1.0000 1.0000 1.0000 0.9999 0.9997 0.9987 0.9987 0.9917 0.9888 0.9750 0.9502 0.9102 0.8505 0.7682 0.6627 0.6228 0.5372 0.3993 0.2618 0.1783 0.1409 0.0530 0.0084   | 1.0000 | 00001  | 0.9999 | 0.9997 | 0.9987 | 0.9957 | 0.9917 | 0.9888 | 0.9750 | 0.9502 | 0.9102 ( | 0.8505 0 | 0.7682 0 | 0.6627 0.  | .6228 0.     | 5372 0. | 3993 0. | 2618 0. | 1783 0  | .1409 0 | 0530 0 | .0084 |
| 7     | $ \left  1,0000\ 1,0000\ 1,0000\ 1,0000\ 1,0000\ 1,0000\ 0,9999\ 0,9996\ 0,9986\ 0,9962\ 0,9909\ 0,9805\ 0,9615\ 0,96295\ 0.8789\ 0.8569\ 0,8040\ 0,6997\ 0,5638\ 0,4573\ 0,4005\ 0,2252\ 0,0712 \right  \\  \left  1,0000\$ | 1.0000 | 00001  | 1.0000 | 1.0000 | 0.9999 | 0.9996 | 0.9990 | 0.9986 | 0.9962 | 0.9909 | 0.9805   | 0.9615 0 | 0.9295 0 | 0.8789 0.  | .8569 0.     | 8040 0. | 6997 0. | 5638 0. | .4573 0 | .4005 0 | 2252 0 | .0712 |
| ∞     | $8 \left  1.0000\$           | 1.0000 | 00001  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9999 | 0.9997 | 0.9992 | 0.9980   | 0.9954 0 | 0 6686.0 | 0.9793 0.  | .9740 0.     | 9596 0. | 9249 0. | 8658 0. | 8062 0  | .7684 0 | 6126 0 | 3698  |
| 6     | 1.0000 1.0              | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 1.0000 1 | .0000    | .0000 1.   | .0000 1.     | 0000 1. | 0000 1. | 0000    | 0000 1  | .0000 1 | 0000 1 | 0000  |

| n = 10 | -      |        |   |        |        |          |          |          |          |          |        |        |   |         |         |         |         |         |         |         |          |         |       |
|--------|--------|--------|---|--------|--------|----------|----------|----------|----------|----------|--------|--------|---|---------|---------|---------|---------|---------|---------|---------|----------|---------|-------|
| d      | 0.05   | 0.1    | <i>p</i> 0.05 0.1 0.15 1/6 0.2 0.25 0.3 1/3 | 1/6    | 0.2    | 0.25     | 0.3      | 1/3      | 0.35     | 0.4      | 0.45   | 0.5    | 0.35  0.4  0.45  0.5  0.55  0.6  0.65  2/3  0.7  0.75  0.8  5/6  0.85  0.9  0.95  | 9.0     | 0.65    | 2/3     | 0.7     | 0.75    | 0.8     | 9/9     | 0.85     | 6.0     | 0.95  |
| x = 0  | 0.5987 | 0.3487 | 0.1969                                      | 0.1615 | 0.1074 | 0.0563   | 3 0.0282 | 9.0173   | 3 0.0135 | 090000   | 0.0025 | 0.0010 | x = 0   0.5987 0.3487 0.1969 0.1615 0.1074 0.0563 0.0282 0.0173 0.0135 0.0060 0.0025 0.0010 0.0003 0.0000 0.000   | .0001 0 | 0 00000 | 00000   | 00000   | 0 0000  | 00000   | 00000   | 0.0000.0 | 0 0000. | 0000  |
| 1      | 0.9139 | 0.7361 | 0.5443                                      | 0.4845 | 0.3758 | 3 0.2440 | 0.1493   | 3 0.1040 | 0.0860   | 0.0464   | 0.0233 | 0.0107 | 1 0.9139 0.7361 0.5443 0.4845 0.3758 0.2440 0.1493 0.1040 0.0860 0.0464 0.0233 0.0107 0.0045 0.0017 0.0005 0.0004 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   | .0017 0 | .0005 0 | .0004 0 | .0001 0 | 00000   | 00000   | 00000   | 0,0000.0 | 00000   | 0000  |
| 2      | 0.9885 | 0.9298 | 0.8202                                      | 0.7752 | 0.6778 | 3 0.525€ | 5 0.3828 | 3 0.2991 | 0.2616   | , 0.1673 | 0.0996 | 0.0547 | 2   0.9885 0.9298 0.8202 0.7752 0.6778 0.5256 0.3828 0.2991 0.2616 0.1673 0.0996 0.0547 0.0274 0.0123 0.0048 0.0034 0.0016 0.0004 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000   | .0123 0 | .0048 0 | .0034 0 | .0016 0 | 0004 0  | .0001 0 | 00000   | 0.0000.0 | 00000   | 0000  |
| 3      | 0.9990 | 0.9872 | 0.9500                                      | 0.9303 | 0.8791 | 0.7759   | 9 0.6496 | 5 0.5593 | 3 0.5138 | 3 0.3823 | 0.2660 | 0.1719 | 3   0.9990 0.9872 0.9500 0.9303 0.8791 0.7759 0.6496 0.5593 0.5138 0.3823 0.2660 0.1719 0.1020 0.0548 0.0260 0.0197 0.0106 0.0035 0.0009 0.0003 0.0001 0.0000 0.0000  | .0548 0 | .0260 0 | 0197 0  | .0106 0 | .0035 0 | 0 6000. | .0003   | 0.0001   | 00000   | 0000  |
| 4      | 0.9999 | 0.9984 | 0.9901                                      | 0.9845 | 0.9672 | 0.9219   | 9 0.8497 | 7 0.7869 | 0.7515   | 0.6331   | 0.5044 | 0.3770 | 4   0.9999 0.9984 0.9901 0.9845 0.9672 0.9219 0.8497 0.7869 0.7515 0.6331 0.5044 0.3770 0.2616 0.1662 0.0949 0.0766 0.0473 0.0197 0.0064 0.0024 0.0014 0.0001 0.0000  | .16620  | .0949 0 | 0 9920. | .0473 0 | .0197 0 | .0064 0 | .0024 0 | 0.0014 0 | .0001 0 | 0000  |
| 5      | 1.0000 | 0.9999 | 0.9986                                      | 0.9976 | 0.9936 | 0.9803   | 3 0.9527 | 7 0.9234 | 1 0.9051 | 0.8338   | 0.7384 | 0.6230 | 1.0000 0.9999 0.9986 0.9976 0.9936 0.9936 0.9803 0.9527 0.9234 0.9051 0.8338 0.7384 0.6230 0.4956 0.3669 0.2485 0.2131 0.1503 0.0781 0.0328 0.0155 0.0099 0.0016 0.0001   | .3669 0 | 2485 0  | .2131 0 | .1503 0 | 07810   | .0328 0 | .0155   | 0 6600'  | .0016   | .0001 |
| 9      | 1.0000 | 1.0000 | 0.9999                                      | 0.9997 | 0.9991 | 0.9965   | 5 0.9894 | 1 0.9803 | 3 0.9740 | 0.9452   | 0.8980 | 0.8281 | 6   1.0000 1.0000 0.9999 0.9997 0.9991 0.9965 0.9894 0.9803 0.9740 0.9452 0.8980 0.8281 0.7340 0.6177 0.4862 0.4407 0.3504 0.2241 0.1209 0.0697 0.0500 0.0128 0.0010  | .6177 0 | .4862 0 | .4407 0 | .3504 0 | .2241 0 | .1209 0 | 0 690.  | 0.0500   | .0128 0 | .0010 |
| 7      | 1.0000 | 1.0000 | 1.0000                                      | 1.0000 | 0.9995 | 0.9996   | 5 0.9984 | 1 0.9966 | 5 0.9952 | 0.9877   | 0.9726 | 0.9453 | $7 \mid 1.0000 \mid 1.0000 \mid 1.0000 \mid 1.0000 \mid 1.0000 \mid 0.9999 \mid 0.9999 \mid 0.9984 \mid 0.9966 \mid 0.9952 \mid 0.9877 \mid 0.9726 \mid 0.9453 \mid 0.9004 \mid 0.8327 \mid 0.7384 \mid 0.7089 \mid 0.6172 \mid 0.4744 \mid 0.3222 \mid 0.2248 \mid 0.1798 \mid 0.0702 \mid 0.0115 \mid 0.9999 \mid 0.9999 \mid 0.9999 \mid 0.9984 \mid 0.9984 \mid 0.9987 \mid 0.99726 \mid $  | .8327 0 | .7384 0 | .7009 0 | .6172 0 | 4744 0  | .3222 0 | .2248 0 | 0.1798 0 | .0702 0 | .0115 |
| ∞      | 1.0000 | 1.0000 | 1.0000                                      | 1.0000 | 1.000C | 1.0000   | 0.9999   | 0.9996   | 5 0.9995 | 0.9983   | 0.9955 | 0.9893 | $8 \mid 1.0000 \mid 1.0000$ | .9536 0 | 9140 0  | 0 0968. | .8507 0 | .75600  | .6242 0 | .5155   | 0.4557 0 | 2639 0  | .0861 |
| 6      | 1.0000 | 1.0000 | 1.0000                                      | 1.0000 | 1.000C | 1.0000   | 0.0001   | 1.0000   | ) 1.0000 | 0.9999   | 0.9997 | 0.9990 | 9   1.0000   | .9940 0 | 9865 0  | .9827 0 | .9718 0 | .9437 0 | .8926 0 | .8385   | 0.8031 0 | .6513 0 | .4013 |
| 10     | 1,000  | 1.0000 | 1.0000                                      | 1.0000 | 1.000  | 1.000    | 00001    | 1.000    | 1.000    | 1.0000   | 1.0000 | 1.0000 | 10 11 0000   | 0000    | 0000    | 0000    | 0000    | 0000    | 0000    | 0000    | 0000     | 0000    | 0000  |

|        | 0.35  0.4  0.45  0.5  0.55  0.6  0.65  2/3  0.7  0.75  0.8  5/6  0.85  0.9  0.95 | $x = 0 \   0.5404 \ 0.2824 \ 0.1422 \ 0.1122 \ 0.0687 \ 0.0317 \ 0.0138 \ 0.0077 \ 0.0057 \ 0.0022 \ 0.0008 \ 0.0002 \ 0.0001 \ 0.00000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.00000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.00000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.00000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.00000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.00000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.00000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.00000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.00000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.000000 \ 0.000000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.00000 \ 0.000000 $ | 0.8816 0.6590 0.4435 0.3813 0.2749 0.1584 0.0850 0.0540 0.0424 0.0196 0.0083 0.0032 0.0011 0.0003 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 | 0.9804 0.8891 0.7358 0.6774 0.5583 0.3907 0.2528 0.1811 0.1513 0.0834 0.0421 0.0193 0.0079 0.0028 0.0008 0.0005 0.0002 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 | 3  0.9978 0.9744 0.9078 0.8748 0.7946 0.6488 0.4925 0.3931 0.3467 0.2253 0.1345 0.0730 0.0356 0.0153 0.0056 0.0059 0.0017 0.0004 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 | 4   0.9998 0.9957 0.9761 0.9636 0.9274 0.8424 0.7237 0.6315 0.5833 0.4382 0.3044 0.1938 0.1117 0.0573 0.0255 0.0188 0.0095 0.0028 0.0006 0.0002 0.0001 0.0000 0.0000 | 1.0000 0.9995 0.9954 0.9921 0.9806 0.9456 0.8822 0.8223 0.7873 0.6652 0.5269 0.3872 0.2607 0.1582 0.0846 0.0664 0.0386 0.0143 0.0039 0.0013 0.0007 0.0001 0.0000 | 6   1.0000 0.9999 0.9993 0.9987 0.9961 0.9857 0.9614 0.9336 0.9154 0.8418 0.7393 0.6128 0.4731 0.3348 0.2127 0.1777 0.1178 0.0544 0.0194 0.0079 0.0046 0.0005 0.0000 | 7   1.0000 1.0000 0.9999 0.9998 0.9994 0.9972 0.9905 0.9812 0.9745 0.9427 0.8883 0.8062 0.6956 0.5618 0.4167 0.3685 0.2763 0.1576 0.0726 0.0364 0.0239 0.0043 0.0002 | 8   1.0000 1.0000 1.0000 1.0000 0.9999 0.9996 0.9983 0.9961 0.9944 0.9847 0.9644 0.9270 0.8655 0.7747 0.6533 0.6069 0.5075 0.3512 0.2054 0.1252 0.0922 0.0256 0.0022 | 9   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9998 0.9995 0.9992 0.9972 0.9921 0.9807 0.9579 0.9166 0.8487 0.8189 0.7472 0.6093 0.4417 0.3226 0.2642 0.1109 0.0196 | 10 1.0000 | 11 11,0000 |  |
|--------|--|--|---|--|--|--|--|--|--|--|--|--|---|--|
|        | 5/6 0.8  | 00.00000.000   | 00.00000.00   | 00.00000.00  | 0.0000 0.00  | 6 0.0002 0.00  | 9 0.0013 0.00  | 4 0.0079 0.00  | 5 0.0364 0.02  | 4 0.1252 0.09  | 7 0.3226 0.26  | 1 0.6187 0.55  | 3 0.8878 0.85   |  |
|        | 0.75 0.8   | 0.0000 0.000   | 0.0000 0.000  | 0.0000 0.000   | 0.0004 0.000   | 0.0028 0.000   | 0.0143 0.003   | 0.0544 0.019   | 0.1576 0.072   | 3512 0.205   | 0.6093 0.441   | 3.8416 0.725   | 0.9683 0.931.   |  |
|        | 0.7  | 0.0000   | 0.0000 0  | 0.0002   | 0.0017   | 0.0095   | 0.0386   | 0.1178   | 0.2763   | 0.5075   | 0.7472   | 0.91500  | 0.9862  |  |
|        | 2/3  | 0 00000  | 1 0.0000  | 8 0.0005   | 6 0.0039   | 5 0.0188   | 6 0.0664   | 7 0.1777   | 7 0.3685   | 3 0.6069   | 7 0.8189   | 6 0.9460   | 3 0.9923  |  |
|        | 5 0.65   | 000.000  | 03 0.000  | 28 0.000   | 53 0.005   | 73 0.025   | 82 0.084   | 48 0.212   | 18 0.416   | 47 0.653   | 66 0.848   | 04 0.957   | 78 0.994.   |  |
|        | 55 0.6   | 0001 0.00  | 0011 0.00   | 00.0 6200  | 1356 0.01  | 117 0.05   | 507 0.15   | 731 0.33   | 956 0.56   | 5655 0.77  | 1579 0.91  | 917 0.98   | 992 0.99  |  |
|        | 0.5 0.   | .0002 0.0  | .0032 0.0   | .0193 0.0  | .0730 0.0  | .1938 0.1  | .3872 0.2  | .6128 0.4  | .8062 0.6  | .9270 0.8  | 9807 0.9   | 9968 0.9   | 9998 0.9  |  |
|        | 0.45   | 0.0008 0   | 0.0083 0  | 0.0421 0   | 0.1345 0   | 0.3044 0   | 0.5269 0   | 0.7393 0   | 0.88830  | 0.9644 0   | 0.9921 0   | 0.9989 0   | 0.6666.0  |  |
|        | 0.4  | 7 0.0022   | 4 0.0196  | 3 0.0834   | 7 0.2253   | 3 0.4382   | 3 0.6652   | 4 0.8418   | 5 0.9427   | 4 0.9847   | 2 0.9972   | 9 0.9997   | 0 1.0000  |  |
|        |  | 77 0.005   | 40 0.042  | 11 0.151.  | 31 0.346   | 15 0.583.  | 23 0.787.  | 36 0.915   | 12 0.974:  | 61 0.994   | 95 0.9992  | 9666.0 00  | 00 1.0000   |  |
|        | .3 1/:   | 138 0.00   | 850 0.05  | 528 0.18   | 925 0.39.  | 237 0.63   | 822 0.82   | 614 0.93   | 905 0.98   | 983 0.99   | 998 0.99   | 000 1.00   | 000 1.00  |  |
|        | 0.25 0   | .0317 0.0  | .1584 0.0   | .3907 0.2  | .6488 0.4  | .8424 0.7  | .9456 0.8  | .9857 0.9  | .9972 0.9  | 6.0 9666.  | 0000 0.9   | .0000 1.0  | .0000 1.0   |  |
|        | 0.2  | 0.0687 0.  | 0.2749 0.   | 0.5583 0.  | 0.7946 0.  | 0.9274 0.  | 0.9806 0   | 0.9961 0.  | 0.9994 0.  | 0.9999 0.  | 1.0000 1   | 1.0000 1   | 1.0000 1.   |  |
|        | 1/6  | 2 0.1122   | 5 0.3813  | 3 0.6774   | 3 0.8748   | 1 0.9636   | 1 0.9921   | 3 0.9987   | 8666.06  | 000001   | 00001 (  | 00001 (  | 000001  |  |
|        | 0.15   | 24 0.1422  | 90 0.4435   | 31 0.7358  | 14 0.9078  | 57 0.976   | 35 0.9952  | 39 0.9993  | 20 0.9999  | 0001000  | 0001000  | 0001000  | 0001.0000   |  |
|        | <i>p</i> 0.05 0.1 0.15 1/6 0.2 0.25 0.3 1/3                                      | 404 0.282  | 816 0.659   | 804 0.889  | 978 0.974  | 998 0.995  | 966.0 000  | 966.0 000  | 000 1.000  | 000 1.000  | 000 1.000  | 000 1.000  | 000 1.000   |  |
| n = 12 | p 0.0  | = 0 0.5  | 1 0.8   | 2 0.9  | 3 0.9  | 4 0.9  | 5 1.0  | 6 1.0  | 7 1.0  | 8 1.0  | 9 1.0  | 10 1.0   | 11 1.0  |  |

| p         0.05         0.1         0.15         1/6         0.2         0.25         0.6         0.65         2/3         0.7         0.75         0.8         5/6         0.85         0.9         0.95           x = 0         0.4877 0.2288 0.1028 0.0779 0.0440 0.0178 0.0068 0.0034 0.0024 0.0008 0.0002 0.0001 0.0000 0.   | 1 0.15<br>288 0.1028<br>346 0.3567<br>116 0.6475<br>559 0.8535<br>908 0.9533 | 3 0.0779<br>3 0.0779<br>7 0.2960<br>9 0.5795 | 0.2     | 0.25       | 0.3      | 1/3    | 0.35   | 0.4      | 0.35  0.4  0.45  0.5  0.55  0.6  0.65  2/3  0.7  0.75  0.8  5/6  0.85  0.9  0.95 | 0.5      | 0.55      | 90        | 0.65 	 2   | ) (2/3   | ) 7 (    | 75 (     | 3.8      | ) 9/9   | ).85     | 0 6 (   |      |
|--|--|--|---------|------------|----------|--------|--|----------|--|----------|-----------|-----------|------------|----------|----------|----------|----------|---------|----------|---------|------|
| .4877 0.22 .8470 0.58 .9699 0.84 .9958 0.95 .9996 0.99   | 288 0.1028 346 0.3567 116 0.6475 559 0.8535 908 0.9533                       | \$ 0.0779<br>7 0.296C<br>9 0.5795            | 1000    |            |          | ,      |  |          |  |          | 2000      | 0.0       |            | 2        | , ,      |          |          |         |          |         | .95  |
| 0.8470 0.58<br>0.9699 0.84<br>0.9958 0.95<br>0.9996 0.99<br>1.0000 0.99  | 346 0.3567<br>116 0.6479<br>559 0.8535<br>908 0.9533<br>985 0.9885           | 0.2960                                       | 10.04   | 0.017      | 8 0.0068 | 0.0034 | $0.0024 \ 0.0008 \ 0.0002 \ 0.0001 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000 \ 0.0000$    | 0.0008 0 | .0002 0  | .0001 C  | 0.0000 0. | .0000     | 0000 0.0   | 0000     | 0000     | 0000     | 0000     | 0000    | 0000 0.0 | 0000    | 0000 |
| 0.9699 0.84<br>0.9958 0.95<br>0.9996 0.99<br>1.0000 0.99   | 116 0.6479<br>559 0.8535<br>908 0.9533<br>985 0.9885                         | 0.5795                                       | 0.197   | 9 0.1010   | 0.0475   | 0.0274 | $0.0205\ 0.0081\ 0.0029\ 0.0009\ 0.0003\ 0.0001\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$         | 0.0081 0 | .0029 0  | 0.0009   | 0.0003 0. | .0001 0.  | 0000 0.0   | 0000     | 0000     | 0000     | 0000     | 0000 0. | 0000 0.0 | 0000    | 0000 |
| 0.9958 0.95<br>0.9996 0.99<br>1.0000 0.99  | 359 0.8535<br>308 0.9533<br>385 0.9885                                       | 29000  | 5 0.448 | 1 0.281    | 1 0.1608 | 0.1053 | $0.0839\ 0.0398\ 0.0170\ 0.0065\ 0.0022\ 0.0006\ 0.0001\ 0.0001\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$ | 0.0398 0 | 0.0170   | 0.0065   | 0.0022 0. | .00006 0. | .0001 0.0  | 0.001    | 0000     | 0000 0.0 | 0000     | 0000 0. | 0000 0.0 | 0000    | 0000 |
| 0.9996 0.95<br>1.0000 0.95<br>1.0000 0.95  | 308 0.9533<br>385 0.9885   | 0.000  | 3 0.698 | 2 0.521    | 3 0.3552 | 0.2612 | $0.2205\ 0.1243\ 0.0632\ 0.0287\ 0.0114\ 0.0039\ 0.0011\ 0.0007\ 0.0002\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$ | 0.1243 0 | .0632 0  | 0.0287   | 0.0114 0. | .0039 0.  | .0011 0.0  | 0.007    | 0002 0.0 | 0000 0.0 | 0000     | 0000 0. | 0000 0.0 | 0000    | 0000 |
| 1.0000 0.95  | 385 0.9885   | 3 0.9310                                     | 0.870   | 2 0.741;   | 5 0.5842 | 0.4755 | $0.4227\ 0.2793\ 0.1672\ 0.0898\ 0.0426\ 0.0175\ 0.0060\ 0.0040\ 0.0017\ 0.0003\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$         | 0.2793 0 | .1672 0  | 0.898 0  | 0.0426 0. | .0175 0.  | 0.00 0900. | 0.040    | 0.07100  | 0003 0.0 | 0000     | 0000    | 0000     | 0000    | 0000 |
| 1,0000 0.99  |  | 5086.0                                       | 96.06   | 1 0.888    | 3 0.7805 | 0.6898 | 0.6405 (   | 0.4859 0 | .3373 0  | .2120 G  | 0.11890   | .05830    | .0243 0.0  | 0174 0.0 | )083 O.  | 0022 0.0 | <u> </u> | 0001 0. | 0000 0.0 | 0000    | 0000 |
|  | 3266.0866  | 3 0.9955                                     | 986.0   | 4 0.9617   | 7 0.9067 | 0.8505 | $0.8164\ 0.6925\ 0.5461\ 0.3953\ 0.2586\ 0.1501\ 0.0753\ 0.0576\ 0.0315\ 0.0103\ 0.0024\ 0.0007\ 0.0003\ 0.0000\ 0.0000$         | 0.6925 0 | .5461 0  | 0.3953 0 | 0.2586 0. | .1501 0.  | .0753 0.0  | )576 0.0 | 3315 0.0 | 0.03     | 3024 0.0 | 0007 0. | 0003 0.0 | 0000    | 0000 |
| 7   1.0000 1.0000 0.9997 0.9993 0.9976 0.9897 0.9685 0.9424  | 700 0.9997   | 7 0.9993                                     | 3 0.997 | '6 0.989', | 7 0.9685 | 0.9424 | $0.9247\ 0.8499\ 0.7414\ 0.6047\ 0.4539\ 0.3075\ 0.1836\ 0.1495\ 0.0933\ 0.0383\ 0.0116\ 0.0041\ 0.0022\ 0.0002\ 0.0000$         | 0.84990  | .7414 0  | .6047 C  | 0.4539 0. | .3075 0.  | 1836 0.1   | 1495 0.0 | 1933 0.0 | )383 0.0 | 0116 0.0 | 0041 0. | 0022 0.0 | 0002 0. | 0000 |
| 8   1.0000 1.0000 1.0000 0.9999 0.9996 0.9978 0.9917 0.9826 0.9757 0.9417 0.8811 0.7880 0.6627 0.5141 0.3595 0.3102 0.2195 0.1117 0.0439 0.0191 0.0115 0.0015 0.0000   | 000 1.0000   | 9666.0 (                                     | 90.999  | 326 0.9978 | 8 0.9917 | 0.9826 | 0.9757   | 0.9417 0 | .8811 0  | 0.7880   | 0.6627 0. | .5141 0.  | .3595 0.3  | 3102 0.2 | 2195 0.  | 1117 0.0 | 3439 0.0 | 01910.  | 0115 0.0 | 0015 0. | 0000 |
| $   1,0000\ 1$     | 000 1.0000   | ) 1.0000                                     | 000.1   | 0.9997     | 7 0.9983 | 0.9960 | 0.9940 (   | 0.9825 0 | 9574 0   | .9102 0  | 0.8328 0. | .7207 0.  | .5773 0.5  | 5245 0.4 | 1158 0   | 2585 0.1 | 1298 0.0 | 0690    | 0467 0.0 | 0092 0. | 0004 |
| 10000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9998 0.9993   | )00 1.000C   | ) 1.0000                                     | 000.1   | 00 1.0000  | 0.9998   | 0.9993 | $0.9989\ 0.9961\ 0.9886\ 0.9713\ 0.9368\ 0.8757\ 0.7795\ 0.7388\ 0.6448\ 0.4787\ 0.3018\ 0.1937\ 0.1465\ 0.0441\ 0.0042$         | ).9961 0 | 0 9886   | .9713 0  | 0.9368 0. | .8757 0.  | .7795 0.7  | 7388 0.0 | 5448 0.  | 1787 0.3 | 3018 0.  | 1937 0. | 1465 0.0 | 0.441   | 0042 |
| 11   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9999 0.9999 0.9994 0.9978 0.9935 0.9830 0.9602 0.9161 0.8947 0.8392 0.7189 0.5519 0.4205 0.3521 0.1584 0.0301  | 000 1.0000   | ) 1.0000                                     | 000.1   | 00 1.0000  | 0.00010  | 0.9999 | 0.9999 (   | ).9994 0 | 0.8266.  | 0.9935 0 | 0.9830 0. | .9602 0.  | .9161 0.8  | 3947 0.8 | 3392 0.  | 7189 0.5 | 5519 0.4 | 4205 0. | 3521 0.  | 1584 0. | 0301 |
| 12   1.0000 1.000    | 000 1.0000   | ) 1.0000                                     | 000.1   | 00 1.0000  | 0000.1 C | 1.0000 | 1.0000 (   | 0 6666.0 | 0 2666   | 0.9991   | 0.9971 0. | .9919 0.  | 9795 0.5   | 3726 0.5 | 9525 O.R | 3990 0.8 | 3021 0.7 | 7040 0. | 6433 0.4 | 1154 0. | 1530 |
| 13   1.0000 1.000    | 000 1.0000   | ) 1.0000                                     | 000.1   | 00 1.0000  | 0000.1 C | 1.0000 | 1.0000 1   | 1.0000 1 | 00000  | 0 6666.  | 0.8666.0  | .9992 0.  | 3.0 9766.  | 30 9966  | 3932 0.3 | 3822 0.5 | 9560 0.5 | 9221 0. | 8972 0.7 | 7712 0. | 5123 |
| $14 \left  1.0000\ 1.00000\ 1.00000\ 1.00000\ 1.00000\ 1.00000\ 1$ | 000 1.0000   | ) 1.0000                                     | 000.1   | 00 1.0000  | 0000.1 0 | 1.0000 | 1.0000 1   | 1.0000 1 | .0000  | .0000    | .0000 1.  | .0000 1.  | .0000 1.0  | 0000 1.0 | 0000     | 0000 1.0 | 0000     | 0000 1. | 0000 1.0 | 0000    | 0000 |

| u = 10 | 9          |   |          |          |         |          |          |          |   |         |         |          |          |           |          |          |           |          |          |  |        |        |
|--------|------------|---|----------|----------|---------|----------|----------|----------|---|---------|---------|----------|----------|-----------|----------|----------|-----------|----------|----------|--|--------|--------|
| D      | 0.05       | 0.05  0.1  0.15  1/6  0.2  0.25  0.3  1/3   | 0.15     | 1/6      | 0.2     | 0.25     | 0.3      |          | 0.35  | 0.4     | .45     | 0.5 C    | ).55 (   | 0 9.0     | .65 2    | /3 0     | .7 0.     | 75 0.8   | 5/6      | 0.35  0.4  0.45  0.5  0.55  0.6  0.65  2/3  0.7  0.75  0.8  5/6  0.85  0.9  0.95 | 6.0    | 0.95   |
| x = x  | 0.4401     | x = 0   0.4401 0.1853 0.0743 0.0541 0.0281 0.0100 0.0033 0.001  | 0.0743 ( | 0.0541 0 | 0.0281  | 0.0100   | 0.0033   | 0.0015 C | 5 0.0010 0.0003 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000           | 0003 0. | 0001 0. | 0000     | 0000 0.0 | 0000      | 0.0000   | 0.0 000  | 000 000   | 00.00    | 000'0 00 | 0 0.0000   | 0.0000 | 0.0000 |
|        | 0.8108     | 0.8108 0.5147 0.2839 0.2272 0.1407 0.0635 0.0261 0.0137 0.0098 0.0033 0.0010 0.0003 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   | 0.2839 ( | 0.2272 0 | ).1407  | 0.0635   | 0.0261   | 0.0137   | 0.8600.0  | 0033 0. | 00100   | 0003 0.0 | 0001 0.0 | 0000 0.0  | 0.0000   | 0.0000   | 0.00 0.00 | 00.00    | 000.000  | 0 0.0000   | 0.0000 | 0.0000 |
|        | 2 0.9571   | 2 0.9571 0.7892 0.5614 0.4868 0.3518 0.1971 0.0994 0.0594 0.0451 0.0183 0.0066 0.0021 0.0006 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 0.5614 ( | 0.4868 0 | 3518    | 0.1971   | 0.0994 ( | 0.0594 ( | 0.0451 0.   | 0183 0. | 00066   | 0021 0.0 | 0000 0.0 | 0.001     | 0.0000   | 0.0000   | 0.00 0.00 | 00.00    | 000.000  | 0 0.0000   | 0.0000 | 0.0000 |
|        | 3 0.9930   | 3   0.9930 0.9316 0.7899 0.7291 0.5981 0.4050 0.2459 0.1659 0.1339 0.0651 0.0281 0.0106 0.0035 0.0009 0.0002 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   | 0.7899 ( | 0.7291 0 | ).5981  | 0.4050 ( | 0.2459 ( | 0.1659 ( | 0.1339 0.   | 0651 0. | 0281 0. | 0106 0.0 | 0035 0.0 | 0.00 0.0  | 0.00 0.0 | 0.01000  | 0.00 0.00 | 00.00    | 000.000  | 0 0.0000   | 0.0000 | 0.0000 |
| 7      | 1 0.9991   | 4   0.9991 0.9830 0.9209 0.8866 0.7982 0.6302 0.4499 0.3391 0.2892 0.1666 0.0853 0.0384 0.0149 0.0049 0.0013 0.0008 0.0003 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 0.9209 ( | 0.8866   | 7982    | 0.6302 ( | 0.4499 ( | 0.3391   | 0.2892 0.   | 1666 0. | 0853 0. | 0384 0.0 | 0149 0.0 | 0.049 0.0 | 0.03 0.0 | 0.08 0.0 | 003 0.00  | 00.00    | 000.000  | 0 0.0000   | 0.0000 | 0.0000 |
|        | 5   0.9999 | 5   0.9999 0.9967 0.9765 0.9622 0.9183 0.8103 0.6598 0.5469 0.4900 0.3288 0.1976 0.1051 0.0486 0.0191 0.0062 0.0040 0.0016 0.0003 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   | 0.9765   | 0.9622 0 | ).9183  | 0.8103 ( | 0.6598 ( | 0.5469 ( | .4900 0   | 3288 0. | 1976 0. | 1051 0.0 | 0486 0.0 | 191 0.0   | 0.0 2900 | 0.0 070  | 016 0.00  | 003 0.00 | 000'0 00 | 0 0.0000   | 0.0000 | 0.0000 |
|        | 5 1.0000   | 6   1.0000 0.9995 0.9944 0.9899 0.9733 0.9204 0.8247 0.737  | 0.9944 ( | 0.9899 ( | ).9733  | 0.9204 ( | 0.8247 ( | 0.7374   | 4 0.6881 0.5272 0.3660 0.2272 0.1241 0.0583 0.0229 0.0159 0.0071 0.0016 0.0002 0.0000 0.0000 0.0000 0.0000                  | 5272 0. | 3660 0. | 2272 0.  | 1241 0.0 | )583 O.C  | 0.0 6220 | 0.0 6510 | 071 0.00  | 0.00     | 02 0.000 | 0 0.0000   | 0.0000 | 0.0000 |
|        | 7 1.0000   | 7   1.0000 0.9999 0.9989 0.9979 0.9930 0.9729 0.9256 0.873  | 0.9989 ( | 0.9979   | ).9930  | 0.9729 ( | 0.9256 ( | 0.8735 ( | $5\ 0.8406\ 0.7161\ 0.5629\ 0.4018\ 0.2559\ 0.1423\ 0.0671\ 0.0500\ 0.0257\ 0.0075\ 0.0015\ 0.0004\ 0.0002\ 0.0000\ 0.0000$ | 7161 0  | 5629 0. | 4018 0   | 2559 0.  | 1423 0.0  | 0.0 129  | 500 0.0  | 257 0.00  | 0.00 570 | 15 0.000 | 4 0.0002   | 0.0000 | 0.0000 |
|        | 3 1.0000   | 8   1.0000 1.0000 0.9998 0.9985 0.9985 0.9925 0.9743 0.9500 0.9329 0.8577 0.7441 0.5982 0.4371 0.2839 0.1594 0.1265 0.0744 0.0271 0.0070 0.0021 0.0011 0.0001 0.0000  | 0.9998 ( | 0 9666.0 | ).9985  | 0.9925 ( | 0.9743 ( | 0.9500 ( | 0.9329 0.   | 8577 0. | 7441 0  | 5982 0.  | 4371 0.2 | 2839 0.1  | 594 0.1  | 265 0.0  | 744 0.03  | 271 0.00 | 70 0.002 | 1 0.0011   | 0.0001 | 0.0000 |
|        | ) 1.0000   | 9   1.0000 1.0000 1.0000 1.0000 0.9998 0.9984 0.9929 0.9841 0.9771 0.9417 0.8759 0.7728 0.6340 0.4728 0.3119 0.2626 0.1753 0.0796 0.0267 0.0101 0.0056 0.0005 0.0000  | 1.0000 1 | 0000.    | ,8666.( | 0.9984 ( | 0.9929 ( | 0.9841   | .9771 0.  | 9417 0. | 8759 0. | 7728 0.0 | 6340 0.4 | 1728 0.3  | 119 0.2  | 626 0.1  | 753 0.0   | 796 0.02 | 67 0.010 | 1 0.0056   | 0.0005 | 0.0000 |
| 1      | ) 1.0000   | 10   1.0000 1.0000 1.0000 1.0000 1.0000 0.9997 0.9984 0.9960 0.9938 0.9809 0.9514 0.8949 0.8024 0.6712 0.5100 0.4531 0.3402 0.1897 0.0817 0.0378 0.0235 0.00033 0.0001  | 1.0000 1 | .0000    | 1.0000  | 0.9997   | 0.9984 ( | 0.9960.0 | 0.8866.0  | 0 6086  | 9514 0. | 8949 0.  | 8024 0.0 | 5712 0.5  | 510004   | 531 0.3  | 402 0.18  | 807 0.08 | 17 0.037 | 8 0.0235   | 0.0033 | 0.0001 |
| 11     | 1.0000     | 11   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9997 0.999   | 1.0000 1 | .0000 1  | 1.0000  | 1.0000 ( | 0.9997   | 0.9992   | $2\ 0.9987\ 0.9951\ 0.9851\ 0.9616\ 0.9147\ 0.8334\ 0.7108\ 0.6609\ 0.5501\ 0.3698\ 0.2018\ 0.1134\ 0.0791\ 0.0170\ 0.0009$ | 9951 0. | 9851 0. | 9616 0.3 | 9147 0.8 | 3334 0.7  | 7108 0.6 | 609 0.5  | 501 0.30  | 598 0.20 | 18 0.113 | 4 0.0791   | 0.0170 | 0.0009 |
| 1.     | 2 1.0000   | 12   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9999 0.9998 0.9991 0.9965 0.9894 0.9719 0.9349 0.8661 0.8341 0.7541 0.5950 0.4019 0.2709 0.2101 0.0684 0.0070   | 1.0000 1 | .0000 1  | 1.0000  | 1.0000   | 1.0000 ( | 0.9999 ( | 0.8666.0  | 9991 0. | 9965 0. | 9894 0.3 | 9719 0.5 | 3349 0.8  | 3661 0.8 | 341 0.7  | 541 0.5   | 950 0.40 | 19 0.270 | 9 0.2101   | 0.0684 | 0.0070 |
|        | 3 1.0000   | 13   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9999 0.9994 0.9979 0.9934 0.9917 0.9549 0.9406 0.9406 0.9006 0.8029 0.6482 0.5132 0.4386 0.2108 0.0429   | 1.0000 1 | .0000 1  | 1.0000  | 1.0000   | 1.0000   | 1.0000 1 | .00000.   | .0 6666 | 9994 0. | 9979 0.  | 9934 0.5 | 3817 0.5  | 549 0.9  | 406 0.9  | 006 0.80  | 0.64     | 82 0.513 | 2 0.4386   | 0.2108 | 0.0429 |
| 1,     | 1.0000     | 14   1.0000 1.000 | 1.0000 1 | .0000 1  | 1.0000  | 1.0000   | 1.0000   | 1.0000 1 | .0000   | 0000    | .0 6666 | 9997 0.  | 5.0 0666 | 30 7966   | 902 0.9  | 863 0.9  | 739 0.93  | 365 0.85 | 93 0.772 | 8 0.7161   | 0.4853 | 0.1892 |
| 1.     | 5 1.0000   | 15   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9999 0.9997 0.9990 0.9985 0.9967 0.9967 0.9900 0.9719 0.9459 0.9257 0.8147 0.5599   | 1.0000 1 | .0000    | 1.0000  | 1.0000   | 1.0000   | 1.0000 1 | .0000   | 0000 1. | 0000 1. | 0000     | 9999 0.5 | 30 7666   | 6.0 0660 | 6.0 586  | 6.0 796   | 76.0 000 | 19 0.945 | 9 0.9257   | 0.8147 | 0.5599 |
| 1      | 5 1.0000   | 16   1.0000 1.000 | 1.0000 1 | .0000 1  | 1.0000  | 1.0000   | 1.0000   | 1.0000 1 | .0000   | 0000    | 0000    | 0000     | 0000 1.0 | 0000 1.0  | 0000 1.0 | 0000 1.0 | 000 1.00  | 000 1.00 | 000.1000 | 0 1.0000   | 1.0000 | 1.0000 |

| n = 18 | 8        |         |   |         |          |         |         |               |        |        |        |        |          |          |        |        |        |        |        |        |        |   |         |       |
|--------|----------|---------|---|---------|----------|---------|---------|---------------|--------|--------|--------|--------|----------|----------|--------|--------|--------|--------|--------|--------|--------|---|---------|-------|
| D      | 0.05     | 0.1     | 0.05  0.1  0.15  1/6  0.2  0.25  0.3  1/3 | 5 1/2   | 6 0.     | 2 0     | .25     | 0.3           | 1/3    | 0.35   | 0.4    | 0.45   | 0.5      | 0.55     | 9.0    | 0.65   | 2/3    | 0.7    | 0.75   | 8.0    | 9/9    | 0.35 0.4 0.45 0.5 0.55 0.6 0.65 2/3 0.7 0.75 0.8 5/6 0.85 0.9   | 6.0     | 0.95  |
| x = 0  | 0.397    | 20.150  | 0.05                                      | 36 0.03 | 176 0.0  | 180 0.0 | 056 0.  | <u>0016 (</u> | 0.0007 | 0.0004 | 0.0001 | 0.0000 | 0.0000   | 0.0000   | 00000  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | x = 0   0.3972 0.1501 0.0536 0.0376 0.0180 0.0056 0.0016 0.0007 0.0004 0.0001 0.0000   | 00000   | 0000  |
|        | 0.773    | 5 0.450 | 33 0.22                                   | 11 0.17 | 728 0.0  | 991 0.0 | 395 0.  | 0142 (        | 9900.0 | 0.0046 | 0.0013 | 0.0003 | 3 0.0001 | 0.0000   | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.7735 0.4503 0.2241 0.1728 0.0991 0.0395 0.0142 0.0068 0.0046 0.0013 0.0003 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 00000   | 0000  |
| 7      | 0.941    | 9 0.733 | 38 0.479                                  | 97 0.40 | 127 0.2  | 713 0.1 | 353 0.  | 0090          | 0.0326 | 0.0236 | 0.0082 | 0.0025 | 5 0.0007 | 7 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 2 0.9419 0.7338 0.4797 0.4027 0.2713 0.1353 0.0600 0.0326 0.0236 0.0082 0.0025 0.0007 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   | 00000   | 0000  |
| 3      | 0.989    | 1 0.90  | 18 0.720                                  | 0.64    | 179 0.50 | 010 0.3 | 3057 0. | 1646 (        | ).1017 | 0.0783 | 0.0328 | 0.0120 | 0.0038   | 3 0.0010 | 0.0002 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 3   0.9891 0.9018 0.7202 0.6479 0.5010 0.3057 0.1646 0.1017 0.0783 0.0328 0.0120 0.0038 0.0010 0.0002 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 00000   | 0000  |
| 4      | 0.998    | 5 0.97  | 18 0.87                                   | 94 0.83 | 118 0.7  | 164 0.5 | 187 0.  | 3327 (        | ).2311 | 0.1886 | 0.0942 | 0.0411 | 0.0154   | 0.0049   | 0.0013 | 0.0003 | 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 4 0.9985 0.9718 0.8794 0.8318 0.7164 0.5187 0.3327 0.2311 0.1886 0.0942 0.0411 0.0154 0.0049 0.0013 0.0003 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   | 00000   | 0000  |
| 5      | 0.999    | 8 0.992 | 36 0.95                                   | 31 0.93 | 47 0.80  | 571 0.7 | 175 0.  | 5344 (        | ).4122 | 0.3550 | 0.2088 | 0.1077 | 7 0.0481 | 0.0183   | 0.0058 | 0.0014 | 0.0009 | 0.0003 | 0.0000 | 0.0000 | 0.0000 | 5 0.9998 0.9936 0.9581 0.9347 0.8671 0.7175 0.5344 0.4122 0.3550 0.2088 0.1077 0.0481 0.0183 0.0058 0.0014 0.0009 0.0003 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 0000    | 0000  |
| 9      | 0001     | 0 0.998 | 38 0.98                                   | 32 0.97 | 794 0.9  | 487 0.8 | 3610 0. | 7217 (        | ).6085 | 0.5491 | 0.3743 | 0.2258 | 3 0.1185 | 0.0537   | 0.0203 | 0.0062 | 0.0039 | 0.0014 | 0.0002 | 0.0000 | 0.0000 | 6   1.0000 0.9988 0.9882 0.9794 0.9487 0.8610 0.7217 0.6085 0.5491 0.3743 0.2258 0.1189 0.0537 0.0203 0.0062 0.0039 0.0014 0.0002 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 00000   | 0000  |
| 7      | 1.000    | 0 0.999 | 38 0.997                                  | 73 0.99 | 47 0.98  | 337 0.5 | 431 0.  | 8593 (        | 7977.0 | 0.7283 | 0.5634 | 0.3915 | 0.2403   | 3 0.1280 | 0.0576 | 0.0212 | 0.0144 | 0.0061 | 0.0012 | 0.0002 | 0.0000 | 7   1.0000 0.9998 0.9973 0.9947 0.9837 0.9431 0.8593 0.7767 0.7283 0.5634 0.3915 0.2403 0.1280 0.0576 0.0212 0.0144 0.0061 0.0012 0.0002 0.0000 0.0000 0.0000 0.0000  | 00000   | 0000  |
| ∞      | 8 1.000  | 0 1.000 | 90 0.999                                  | 95 0.99 | 99 0.9   | 357 0.5 | 9807 0. | 9404 (        | ).8924 | 0.8609 | 0.7368 | 0.5778 | 3 0.4073 | 3 0.2527 | 0.1347 | 0.0597 | 0.0433 | 0.0210 | 0.0054 | 0.0009 | 0.0002 | 1.0000 1.0000 0.9995 0.9989 0.9957 0.9807 0.9404 0.8924 0.8609 0.7368 0.5778 0.4073 0.2527 0.1347 0.0597 0.0433 0.0210 0.0054 0.0009 0.0002 0.0001 0.0000 0.0000  | 00000   | 0000  |
| 6      | 1.000    | 0 1.000 | 90 0.999                                  | 99 0.99 | 98 0.9   | 991 0.5 | 946 0.  | 9790 (        | ).9567 | 0.9403 | 0.8653 | 0.7473 | 3 0.5927 | 7 0.4222 | 0.2632 | 0.1391 | 0.1076 | 0.0596 | 0.0193 | 0.0043 | 0.0011 | $1.0000\ 1.0000\ 0.9999\ 0.9998\ 0.9998\ 0.9994\ 0.9946\ 0.9790\ 0.9567\ 0.9403\ 0.8653\ 0.7473\ 0.5927\ 0.4222\ 0.2632\ 0.1391\ 0.1076\ 0.0596\ 0.0193\ 0.0043\ 0.0011\ 0.0005\ 0.0000\ 0.0000\ 0.0000$  | 00000   | 0000  |
| 10     | 1.000    | 0 1.000 | 00.1.00                                   | 00.100  | 00 0.9   | 998 0.5 | .0 886  | 9939 (        | ).9856 | 0.9788 | 0.9424 | 0.8720 | 0.7597   | 7 0.6085 | 0.4366 | 0.2717 | 0.2233 | 0.1407 | 0.0569 | 0.0163 | 0.0053 | 10 1.0000 1.0000 1.0000 1.0000 0.9998 0.9988 0.9988 0.9985 0.9788 0.9424 0.8720 0.7597 0.6085 0.4366 0.2717 0.2233 0.1407 0.0569 0.0163 0.0053 0.0027 0.0002 0.0000   | .0002   | 0000  |
| 11     | 1.000    | 0 1.000 | 00.1000                                   | 00 1.00 | 00 1.00  | 300 000 | .0 866  | ) 9866        | 1.9961 | 0.9938 | 0.9797 | 0.9463 | 3 0.8811 | 0.7742   | 0.6257 | 0.4509 | 0.3915 | 0.2783 | 0.1390 | 0.0513 | 0.0206 | 11   1.0000 1.0000 1.0000 1.0000 1.0000 0.9998 0.9986 0.9961 0.9938 0.9797 0.9463 0.8811 0.7742 0.6257 0.4509 0.3915 0.2783 0.1390 0.0513 0.0206 0.0118 0.0012 0.0000   | .0012 0 | 0000  |
| 12     | 1.000    | 0 1.000 | 00 1.000                                  | 00 1.00 | 00 1.00  | 000 1.0 | 0000 0. | ) 2666        | 1.9991 | 0.9986 | 0.9942 | 0.9817 | 7 0.9515 | 0.8923   | 0.7912 | 0.6450 | 0.5878 | 0.4656 | 0.2825 | 0.1329 | 0.0653 | 12   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9997 0.9991 0.9986 0.9942 0.9817 0.9519 0.8923 0.7912 0.6450 0.5878 0.4656 0.2825 0.1329 0.0653 0.0419 0.0064 0.0002   | .0064 0 | .0002 |
| 13     | 1.000    | 0 1.000 | 00.1000                                   | 00 1.00 | 00 1.00  | 000 1.0 | 0000 1. | 0000          | 66661  | 0.9997 | 0.9987 | 0.9951 | 0.9846   | 6856.0   | 0.9058 | 0.8114 | 0.7689 | 0.6673 | 0.4813 | 0.2836 | 0.1682 | $1.0000\ 1.00$  | .0282 0 | .0015 |
| 14     | 1.000    | 0 1.000 | 00.1000                                   | 00 1.00 | 00 1.00  | 000 1.0 | 000 1.  | 0000          | 0000.1 | 1.0000 | 0.9998 | 0.9990 | 0.9962   | 9886.0   | 0.9672 | 0.9217 | 0.8983 | 0.8354 | 0.6943 | 0.4990 | 0.3521 | 14   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9998 0.9998 0.9990 0.9962 0.9880 0.9672 0.9217 0.8983 0.8354 0.6943 0.4990 0.3521 0.2798 0.0982 0.0109  | .0982   | .0109 |
| 15     | 1.000    | 0 1.000 | 00.1.000                                  | 00 1.0C | 00 1.00  | 000 1.0 | 000 1.  | 0000          | 0000   | 1.0000 | 1.0000 | 0.9995 | 0.9993   | 3 0.9975 | 0.9918 | 0.9764 | 0.9674 | 0.9400 | 0.8647 | 0.7287 | 0.5973 | 15   1.0000 1.000 | .2662 0 | .0581 |
| 16     | 1.000    | 0 1.000 | 00.1000                                   | 00 1.00 | 00 1.00  | 000 1.0 | 0000 1. | 0000          | 0000.1 | 1.0000 | 1.0000 | 1.0000 | 9666.0 ( | ١ 0.9997 | 0.9987 | 0.9954 | 0.9932 | 0.9858 | 0.9605 | 0.9009 | 0.8272 | 16 1.0000  | .5497 0 | .2265 |
| 17     | 1.000    | 0 1.000 | 00.1000                                   | 00 1.00 | 00 1.00  | 000 1.0 | 000 1.  | 0000          | 0000.1 | 1.0000 | 1.0000 | 1.0000 | ) 1.0000 | 00001    | 0.9999 | 0.9996 | 0.9993 | 0.9984 | 0.9944 | 0.9820 | 0.9624 | 17   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9999 0.9996 0.9993 0.9984 0.9984 0.9920 0.9624 0.9464 0.8499 0.6028  | .8499 0 | .6028 |
| 18     | 18 1.000 | 0 1.000 | 00.1000                                   | 00 1.00 | 00 1.00  | )00 1.0 | 000 1.  | 0000          | 0000.1 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 00001    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | $1.0000\ 1.00000\ 1.00000\ 1.00000\ 1.00000\ 1.00000\$  | .0000   | 0000  |

| n = 20 | 20   |   |          |   |        |        |        |         |         |         |          |          |          |             |  |           |          |        |        |        |        |        |        |         |
|--------|------|---|----------|---|--------|--------|--------|---------|---------|---------|----------|----------|----------|-------------|--|-----------|----------|--------|--------|--------|--------|--------|--------|---------|
| D      | _    | 0.05  | 0.1      | 0.05  0.1  0.15  1/6  0.2  0.25  0.3  1/3 | 1/6    | 0.2    | 0.25   | 0.3     | 1/.     |         | 0.35 0.  | 4 0.     | 45 0.    | 5 0.5       | 0.4  0.45  0.5  0.55  0.6  0.65  2/3  0.7  0.75  0.8  5/6  0.85  0.9  0.95   | 0.65      | 2/3      | 0.7    | 0.75   | 0.8    | 9/9    | 0.85   | 6.0    | 0.95    |
| =x     | 0 :  | x = 0 0.3585 0.1216 0.0388 0.0261 0.0115 0.0032 0.0008 0.0003       | ).1216   | 0.0388                                    | 0.0261 | 0.0115 | 0.0037 | 2 0.00C | 00.08   | J3 0.0  | 0.0 200  | 0.0 000  | 000 0.00 | 000000      | 0.0002 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   | 000.00    | 0 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  |
|        | 1    | 0.7358 0.3917 0.1756 0.1304 0.0692 0.0243 0.0076 0.0033             | .3917    | 0.1756                                    | 0.1304 | 0.0692 | 0.024  | 3 0.007 | 0.00 9. | 33 0.00 | 0.00     | 0.0 500  | 001 0.00 | 00.000      | $0.0021\ 0.0005\ 0.0001\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$   | 0000.00   | 0 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.000.0 |
|        | 7    | 2 0.9245 0.6769 0.4049 0.3287 0.2061 0.0913 0.0355 0.0176           | ).69769  | 3.4049 (                                  | 0.3287 | 0.2061 | 0.091. | 3 0.035 | 5 0.01  | 0.0 97  | 121 0.00 | 0.0 980  | 000 0.00 | 002 0.00    | 0.0121 0.0036 0.0009 0.0002 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 0000.00   | 0 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.000.0 |
|        | 3    | $0.9841\ 0.8670\ 0.6477\ 0.5665\ 0.4114\ 0.2252\ 0.1071\ 0.0604$    | ).8670 ( | ).6477 (                                  | 0.5665 | 0.4114 | 0.225  | 2 0.107 | 1 0.06  |         | 144 0.0  | 160 0.0  | 049 0.00 | 013 0.00    | $0.0444\ 0.0160\ 0.0049\ 0.0013\ 0.0003\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$   | 0000.00   | 0 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.000.0 |
|        | 4    | $0.9974\ 0.9568\ 0.8298\ 0.7687\ 0.6296\ 0.4148\ 0.2375\ 0.1515$    | ).9568 ( | ).8298 (                                  | 7.7687 | 0.6296 | 0.414  | 8 0.237 | 5 0.15  |         | 182 0.0: | 510 0.0  | 189 0.00 | 0.00        | $0.1182\ 0.0510\ 0.0189\ 0.0059\ 0.0015\ 0.0003\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$   | 00000     | 0 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.000.0 |
|        | ) 2  | 5  0.9997 0.9887 0.9327 0.8982 0.8042 0.6172 0.4164 0.2972          | 1.9887   | 3.9327                                    | 3.8982 | 0.8042 | 0.617  | 20.416  | 4 0.29  | 72 0.2  | 154 0.12 | 256 0.0  | 553 0.02 | 207 0.00    | $0.2454\ 0.1256\ 0.0553\ 0.0207\ 0.0064\ 0.0016\ 0.0003\ 0.0002\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$   | 16 0.000  | 3 0.0002 | 000000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  |
|        | 9    | $1.0000\ 0.9976\ 0.9781\ 0.9629\ 0.9133\ 0.7858\ 0.6080\ 0.4793$    | ).9976 ( | ).9781 (                                  | 0.9629 | 0.9133 | 0.785  | 8 0.608 | 0.47    | 93 0.4  | 166 0.2: | 500 0.1  | 299 0.05 | 577 0.02    | $0.4166\ 0.2500\ 0.1299\ 0.0577\ 0.0214\ 0.0065\ 0.0015\ 0.0009\ 0.0003\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$   | 55 0.001. | 5 0.0009 | 0.0003 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.000.0 |
|        |      | $1.0000\ 0.9996\ 0.9941\ 0.9887\ 0.9679\ 0.8982\ 0.7723\ 0.6615$    | ) 9666 ( | ).9941 (                                  | 7.9887 | 0.9679 | 0.8982 | 2 0.772 | 3 0.66  |         | 0.10 0.4 | 159 0.2  | 520 0.13 | 316 0.05    | $0.6010\ 0.4159\ 0.2520\ 0.1316\ 0.0580\ 0.0210\ 0.0060\ 0.0037\ 0.0013\ 0.0002\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$   | 0.006     | 0 0.0037 | 0.0013 | 0.0002 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.000.0 |
|        | ∞    | $1.0000\ 0.9999\ 0.9987\ 0.9972\ 0.9900\ 0.9591\ 0.8867\ 0.8095$    | ) 6666.( | ).9987                                    | 0.9972 | 0.9900 | 0.959  | 1 0.886 | 7 0.80  |         | 524 0.59 | 956 0.4  | 143 0.25 | 517 0.13    | $0.7624\ 0.5956\ 0.4143\ 0.2517\ 0.1308\ 0.0565\ 0.0196\ 0.0130\ 0.0051\ 0.0009\ 0.0001\ 0.0000\ 0.0000\ 0.0000\ 0.0000$   | 55 0.019  | 6 0.0130 | 0.0051 | 0.0009 | 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000  |
|        | 6    | $1.0000\ 1.0000\ 0.9998\ 0.9994\ 0.9974\ 0.9861\ 0.9520\ 0.9081$    | .0000    | ).9998 (                                  | 3.9994 | 0.9974 | 0.986  | 1 0.952 | 06.00   |         | 782 0.7: | 553 0.5  | 914 0.4  | 119 0.24    | $0.8782\ 0.7553\ 0.5914\ 0.4119\ 0.2493\ 0.1275\ 0.0532\ 0.0376\ 0.0171\ 0.0039\ 0.0006\ 0.0001\ 0.0000\ 0.0000\ 0.0000$   | 75 0.053  | 2 0.0376 | 0.0171 | 0.0039 | 0.0006 | 0.0001 | 0.0000 | 0.0000 | 0.000.0 |
| 1      | 10   | 10   1.0000 1.0000 1.0000 0.9999 0.9994 0.9961 0.9829 0.9624        | 0000     | 1.0000                                    | 3.9999 | 0.9994 | 0.996  | 10.982  | 96.06   | 24 0.9  | 168 0.8  | 725 0.7  | 507 0.58 | $881\ 0.40$ | $0.9468\ 0.8725\ 0.7507\ 0.5881\ 0.4086\ 0.2447\ 0.1218\ 0.0919\ 0.0480\ 0.0139\ 0.0026\ 0.0006\ 0.0002\ 0.0000\ 0.0000$   | 17 0.121  | 8 0.0919 | 0.0480 | 0.0139 | 0.0026 | 0.0006 | 0.0002 | 0.0000 | 0.0000  |
|        | 11   | 1.0000 1.0000 1.0000 1.0000 1.0000 0.9999 0.9991 0.9949 0.9870      | 0000     | 1.0000                                    | 1.0000 | 0.9999 | 0.999  | 1 0.994 | 86.06   | 30 0.9  | 304 0.9  | 435 0.8  | 692 0.7  | 183 0.58    | $0.9804\ 0.9435\ 0.8692\ 0.7483\ 0.5857\ 0.4044\ 0.2376\ 0.1905\ 0.1133\ 0.0409\ 0.0100\ 0.0028\ 0.0013\ 0.0001\ 0.0000$   | 14 0.237  | 6 0.1905 | 0.1133 | 0.0409 | 0.0100 | 0.0028 | 0.0013 | 0.0001 | 0.000.0 |
|        | 12   | 12   1.0000 1.0000 1.0000 1.0000 1.0000 0.9998 0.9987 0.9963        | 0000     | 1.0000                                    | 1.0000 | 1.0000 | 0.999  | 8 0.998 | 7 0.99  |         | 940 0.9  | 790 0.9  | 420 0.80 | 584 0.74    | $0.9940\ 0.9790\ 0.9420\ 0.8684\ 0.7480\ 0.5841\ 0.3990\ 0.3385\ 0.2277\ 0.1018\ 0.0321\ 0.0113\ 0.0059\ 0.0004\ 0.0000$   | 11 0.399  | 0 0.3385 | 0.2277 | 0.1018 | 0.0321 | 0.0113 | 0.0059 | 0.0004 | 0.000.0 |
|        | 13   | $1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 0.9997\ 0.9991$            | 0000     | 1.0000                                    | 1.0000 | 1.0000 | 1.0000 | 0.999   | 7 0.99  |         | 985 0.99 | 935 0.9  | 786 0.92 | 123 0.87    | $0.9985\ 0.9935\ 0.9786\ 0.9423\ 0.8701\ 0.7500\ 0.5834\ 0.5207\ 0.3920\ 0.2142\ 0.0867\ 0.0371\ 0.0219\ 0.0024\ 0.0000$   | 00 0.583  | 4 0.5207 | 0.3920 | 0.2142 | 0.0867 | 0.0371 | 0.0219 | 0.0024 | 0.000.0 |
| 1      | 14   | $1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 0.9998$    | 0000     | 0000.1                                    | 1.0000 | 1.0000 | 1.0000 | 0.0010  | 0.099   | 98 0.99 | 197 0.99 | 984 0.9  | 936 0.97 | 793 0.94    | $0.9997\ 0.9984\ 0.9936\ 0.9793\ 0.9447\ 0.8744\ 0.7546\ 0.7028\ 0.5836\ 0.3828\ 0.1958\ 0.1018\ 0.0673\ 0.0113\ 0.0003$   | 14 0.754  | 6 0.7028 | 0.5836 | 0.3828 | 0.1958 | 0.1018 | 0.0673 | 0.0113 | 0.0003  |
|        | 15   | 15   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000        | 0000     | 0000.1                                    | 1.0000 | 1.0000 | 1.000  | 0.000   | 0 1.00  | 00 1.00 | 900 000  | 997 0.9  | 985 0.99 | 941 0.98    | $1.0000\ 0.9997\ 0.9985\ 0.9941\ 0.9811\ 0.9490\ 0.8818\ 0.8485\ 0.7625\ 0.5852\ 0.3704\ 0.2313\ 0.1702\ 0.0432\ 0.0026$   | 30 0.881  | 8 0.8485 | 0.7625 | 0.5852 | 0.3704 | 0.2313 | 0.1702 | 0.0432 | 0.0026  |
|        | 16   | 16   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 | 0000     | 1.0000                                    | 1.0000 | 1.0000 | 1.0000 | 00.100  | 00.100  |         | 000 1.00 | 9.00 000 | 997 0.99 | 987 0.99    | $1.0000\ 1.0000\ 0.9997\ 0.9987\ 0.9951\ 0.9840\ 0.9556\ 0.9396\ 0.8929\ 0.7748\ 0.5886\ 0.4335\ 0.3523\ 0.1330\ 0.0159$   | 10 0.955  | 6 0.9396 | 0.8929 | 0.7748 | 0.5886 | 0.4335 | 0.3523 | 0.1330 | 0.0159  |
|        | 17   | 17   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000        | 0000     | 1.0000                                    | 1.0000 | 1.0000 | 1.000  | 00.100  | 00.1.00 | 00.100  | 000 1.00 | 0.00     | 96.0 000 | 998 0.99    | $1.0000\ 1.0000\ 1.0000\ 0.9998\ 0.9991\ 0.9964\ 0.9879\ 0.9824\ 0.9645\ 0.9087\ 0.7939\ 0.6713\ 0.5951\ 0.3231\ 0.0755$   | 54 0.987  | 9 0.9824 | 0.9645 | 0.9087 | 0.7939 | 0.6713 | 0.5951 | 0.3231 | 0.0755  |
|        | 18   | 18   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 | 0000     | 1.0000                                    | 1.0000 | 1.0000 | 1.0000 | 00.100  | 00.1.00 |         | 000 1.00 | 0.100    | 000 1.00 | 96.0 000    | $1.0000\ 1.0000\ 1.0000\ 1.0000\ 0.9999\ 0.9995\ 0.9979\ 0.9967\ 0.9924\ 0.9757\ 0.9308\ 0.8696\ 0.8244\ 0.6083\ 0.2642$   | 75 0.997  | 9 0.9967 | 0.9924 | 0.9757 | 0.9308 | 0.8696 | 0.8244 | 0.6083 | 0.2642  |
|        | 19   | 19   1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000        | 0000     | 1.0000                                    | 1.0000 | 1.0000 | 1.0000 | 00.100  | 00.1.00 |         | 000 1.00 | 0.00 1.0 | 000 1.00 | 000 1.00    | $1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 0.9998\ 0.9999\ 0.9992\ 0.9968\ 0.9885\ 0.9739\ 0.9612\ 0.8784\ 0.6415$   | 00.0999   | 8 0.9997 | 0.9992 | 0.9968 | 0.9885 | 0.9739 | 0.9612 | 0.8784 | 0.6415  |
| - 7    | 20 j | 20 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000   | 0000     | 1.0000                                    | 1.0000 | 1.0000 | 1.0000 | 000.1 C | 00.100  |         | 000 1.00 | 0.000    | 000 1.00 | 000 1.00    | $1.0000\ 1.00$ | 000.100   | 0 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000  |
|        | 1    |   |          |   |        |        |        |         |         |         |          |          |          |             |  |           |          |        |        |        |        |        |        |         |

| 0.05    | o l  | 0.1 0.15  | 0.15 	 1/6 	 0.2 | 0.2      | 0.25 0.3 | 0.3      | 1/3 (     | 0.35 0.4 | 0.45      | 15 0.5    | 5 0.55  | 9.0      | 0.65   | 2/3    | 0.7    | 0.7 0.75 | 8.0      | 5/6 0.85 | 0.85     | 0.9 0.95 |
|---------|------|---|------------------|----------|----------|----------|-----------|----------|-----------|-----------|---|----------|--------|--------|--------|----------|----------|----------|----------|----------|
| 2774 0. | 0.   | 718 0.017   | 72 0.010         | 5 0.0038 | 0.0008   | 0.0001   | 0.0000 0. | 0.0000   | 0000 0.00 | 00.000    | x = 0   0.2774 0.0718 0.0172 0.0105 0.0038 0.0008 0.0001 0.0000 0.000     | 0 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.000 C  | 00000    | 0.0000.0 | .0000    |
| 6424 0  | 27   | 712 0.093   | 31 0.0629        | 9 0.0274 | 0.0070   | 0.0016   | 0.0005 0. | 0003 0.0 | 0001 0.00 | 00.000    | 0.6424 0.2712 0.0931 0.0629 0.0274 0.0070 0.0016 0.0005 0.0003 0.0001 0.0000   | 0 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000.0 | 0.0000.0 | 0.0000.0 | .0000    |
| 8729 0  | 53   | 171 0.253   | 37 0.1887        | 7 0.0982 | 0.0321   | 0.0000   | 0.0035 0. | 0021 0.0 | 0004 0.00 | 001 0.000 | 0.8729 0.5371 0.2537 0.1887 0.0982 0.0321 0.0090 0.0035 0.0021 0.0004 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   | 0 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000.0 | 0.0000.0 | 0.0000.0 | .00000   |
| 9659 0. | 76   | 36 0.471  | 11 0.3810        | 5 0.2340 | 0.0962   | 0.0332   | 0.0149 0. | 0.0 7600 | 0024 0.00 | 00.000    | 0.9659 0.7636 0.4711 0.3816 0.2340 0.0962 0.0332 0.0149 0.0097 0.0024 0.0005 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 0 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000.0 | 0.0000.0 | 0.0000.0 | .0000    |
| 9928 0  | 96.  | 120 0.682   | 21 0.5937.       | 7 0.4207 | 0.2137   | 0.0905   | 0.0462 0. | 0320 0.0 | 0095 0.00 | )23 0.00  | 0.9928 0.9020 0.6821 0.5937 0.4207 0.2137 0.0905 0.0462 0.0320 0.0095 0.0023 0.0005 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 1 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000.0 | 0.0000.0 | 0.0000.0 | .0000    |
| 0 8866  | 96.  | 368 0.838   | 35 0.7720        | 0.06167  | 0.3783   | 0.1935   | 0.1120 0. | 0826 0.0 | 1294 0.00 | 386 0.00  | 0.9988 0.9666 0.8385 0.7720 0.6167 0.3783 0.1935 0.1120 0.0826 0.0294 0.0086 0.0020 0.0004 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 4 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000.0 | 0.0000.0 | 0.0000.0 | .00000   |
| ) 8666  | 96.( | 05 0.930  | 3068.0 50        | 8 0.7800 | 0.5611   | 0.3407 ( | ).2215 0. | 1734 0.0 | 736 0.02  | 258 0.00  | 6 0.9998 0.9905 0.9305 0.8908 0.7800 0.5611 0.3407 0.2215 0.1734 0.0736 0.0258 0.0073 0.0016 0.0003 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   | 6 0.0003 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000.0 | 0.0000.0 | 0.0000.0 | .0000 0. |
| 0000    | 96.0 | 77 0.974  | 15 0.9552        | 3 0.8909 | 0.7265   | 0.5118 ( | 0.3703 0. | 3061 0.1 | 536 0.06  | 539 0.02  | 1.0000 0.9977 0.9745 0.9553 0.8909 0.7265 0.5118 0.3703 0.3061 0.1536 0.0639 0.0216 0.0058 0.0012 0.0002 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 8 0.0012 | 0.0002 | 0.0001 | 0.0000 | 0.0000   | 0.0000.0 | 00000.0  | 0.0000.0 | .0000    |
| 0000    | 36.0 | 95 0.992  | 20 0.9842        | 3 0.9532 | 0.8506   | 0.6769   | ).5376 0. | 4668 0.2 | 735 0.13  | 340 0.05. | $1.0000\ 0.9995\ 0.9920\ 0.9843\ 0.9532\ 0.8506\ 0.6769\ 0.5376\ 0.4668\ 0.2735\ 0.1340\ 0.0539\ 0.0174\ 0.0043\ 0.0008\ 0.0004\ 0.0001\ 0.00000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.00000\ 0.00000\ 0.00000\ $  | 4 0.0043 | 0.0008 | 0.0004 | 0.0001 | 0.0000   | 0.0000.0 | 0.0000.0 | 0.0000.0 | .0000    |
| 0000    | 96.0 | 766.0 660   | 29 0.9952        | 3 0.9827 | 0.9287   | 0.8106   | ).6956 0. | 6303 0.4 | 1246 0.24 | 124 0.11  | $1.00000\ 0.99990\ 0.9979\ 0.9953\ 0.9923\ 0.9827\ 0.9287\ 0.8106\ 0.6956\ 0.6303\ 0.4246\ 0.2424\ 0.1148\ 0.0440\ 0.0132\ 0.0029\ 0.0016\ 0.0005\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$  | 0 0.0132 | 0.0029 | 0.0016 | 0.0005 | 0.0000   | 0.0000.0 | 0.0000.0 | 0.0000.0 | .00000   |
| 0000    | 1.00 | 966.0 000   | 3866.0 56        | 8 0.9944 | 0.9703   | 0.9022   | ).8220 0. | 7712 0.5 | 858 0.38  | 343 0.21. | 1.0000 1.0000 0.9995 0.9988 0.9944 0.9703 0.9022 0.8220 0.7712 0.5858 0.3843 0.2122 0.0960 0.0344 0.0093 0.0056 0.0018 0.0002 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 0 0.0344 | 0.0093 | 0.0056 | 0.0018 | 0.0002   | 0.0000.0 | 0.0000.0 | 0.0000.0 | .0000    |
| 0000    | 1.00 | 966.0 000   | 79 0.9997,       | 7 0.9985 | 0.9893   | 0.9558   | 0.9082 0. | 8746 0.7 | 7323 0.54 | 126 0.34: | 1.0000 1.0000 0.9999 0.9997 0.9985 0.9893 0.9558 0.9082 0.8746 0.7323 0.5426 0.3450 0.1827 0.0778 0.0255 0.0164 0.0060 0.0009 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000   | 7 0.0778 | 0.0255 | 0.0164 | 0.0060 | 0.0009   | 0.0001   | 0.0000.0 | 0.0000.0 | .0000    |
| 0000    | 1.00 | 000 1.000   | 9666.0 00        | 9666.06  | 0.9966   | 0.9825 ( | ).9585 0. | 9396 0.8 | 3462 0.69 | 137 0.50  | $1.0000\ 1.0000\ 1.0000\ 0.9999\ 0.9996\ 0.9966\ 0.9825\ 0.9585\ 0.9396\ 0.8462\ 0.6937\ 0.5000\ 0.3063\ 0.1538\ 0.0604\ 0.0415\ 0.0175\ 0.0034\ 0.0004\ 0.0001\ 0.00000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.00000\ 0.00000\ 0.00000\ $  | 3 0.1538 | 0.0604 | 0.0415 | 0.0175 | 0.0034   | 0.0004   | 0.0001   | 0.0000.0 | .0000    |
| 0000    | 1.00 | 000 1.000   | 00 1.0000        | 0.09999  | 0.9991   | 0.9940 ( | ).9836 0. | 9745 0.9 | 1222 0.81 | 173 0.65. | $1.0000\ 1.0000\ 1.0000\ 1.0000\ 0.9999\ 0.9999\ 0.9991\ 0.9940\ 0.9836\ 0.9745\ 0.9222\ 0.8173\ 0.6550\ 0.4574\ 0.2677\ 0.1254\ 0.0918\ 0.0442\ 0.0107\ 0.0015\ 0.0003\ 0.0001\ 0.0000\ 0.0000$  | 4 0.2677 | 0.1254 | 0.0918 | 0.0442 | 0.0107   | 0.0015 C | 0.0003   | 0.00010  | .0000    |
| 0000    | 1.00 | 000 1.000   | 00 1.0000        | 0.000010 | 0.9998 ( | 0.9982   | ).9944 0. | 9907 0.9 | 0626 0.90 | 940 0.78  | $1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 0.9998\ 0.9982\ 0.9944\ 0.9907\ 0.9656\ 0.9040\ 0.7878\ 0.6157\ 0.4142\ 0.2288\ 0.1780\ 0.0978\ 0.0297\ 0.0056\ 0.0012\ 0.0005\ 0.0000\ 0.0000\ 0.0000$  | 7 0.4142 | 0.2288 | 0.1780 | 0.0978 | 0.0297   | 0.0056 C | 0.0012   | 0.0005 0 | .0000 0. |
| 0000    | 1.00 | 00 1.000  | 00 1.0000        | 0.00010  | 1.0000   | 0.9995   | ).9984 0. | 9971 0.9 | 868 0.95  | 560 0.88  | $1.0000\ 1.00000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.00000\ 1.00000\ 1.00000\ $  | 6 0.5754 | 0.3697 | 0.3044 | 0.1894 | 0.0713   | 0.0173 C | 0.0047   | 0.0021 0 | .0001 0. |
| 0000    | 1.00 | 000 1.000   | 00 1.0000        | 0.00010  | 1.0000 ( | 0.9999 ( | 0.9996 0. | 9992 0.9 | 957 0.98  | 326 0.94  | 16 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9999 0.9996 0.9995 0.9957 0.9826 0.9461 0.8660 0.7265 0.5332 0.4624 0.3231 0.1494 0.0468 0.0157 0.0080 0.0005 0.0000   | 0 0.7265 | 0.5332 | 0.4624 | 0.3231 | 0.1494   | 0.0468 C | 0.0157   | 0.00800  | .0005 0. |
| 0000    | 1.00 | 000 1.000   | 00 1.0000        | 0.00010  | 1.0000   | 1.0000 ( | 0.6666.0  | 6.0 8666 | 988 0.99  | 342 0.973 | $1.0000\ 1.00$  | 1 0.8464 | 0.6939 | 0.6297 | 0.4882 | 0.2735   | 0.1091   | 0.0447   | 0.0255 0 | .0023 0. |
| 0000    | 1.00 | 000 1.000   | 00 1.0000        | 0.00010  | 1.0000   | 1.0000 1 | 1.0000 1. | 0000 0.9 | 997 0.99  | 384 0.99. | $1.0000\ 1.00$  | 2 0.9264 | 0.8266 | 0.7785 | 0.6593 | 0.4389   | 0.2200 C | 0.1092 0 | 0.0695 0 | .0095 0. |
| 0000    | 1.00 | 000 1.000   | 00 1.0000        | 0.000010 | 1.0000   | 1.0000 1 | 1.0000 1. | 0000 0.9 | 6660 6660 | 366.0 966 | $1.0000\ 1.00$  | 4 0.9706 | 0.9174 | 0.8880 | 0.8065 | 0.6217   | 0.3833 C | 0.2280 0 | 0.16150  | .0334 0. |
| 0000    | 1.00 | 000 1.00C   | 00 1.0000        | 0.00010  | 1.0000   | 1.0000 1 | 1.0000 1. | 0000 1.0 | 0000 0.95 | 66.0 66t  | 1.0000 1.0 | 7 0.9905 | 0.9680 | 0.9538 | 0.9095 | 0.7863   | 0.5793   | 0.4063   | 0.3179 0 | .0980    |
| 0000    | 1.00 | 000 1.000   | 00 1.0000        | 0.00010  | 1.0000   | 1.0000 1 | 1.0000 1. | 0000 1.0 | 0000 1.00 | 900 0.99  | $1.0000\ 1.00$  | 5 0.9976 | 0.9903 | 0.9851 | 0.9668 | 0.9038   | 0.7660 C | .6184    | 0.5289 0 | .2364 0. |
| 0000    | 1.00 | 000 1.000   | 00 1.0000        | 0.00010  | 1.0000   | 1.0000 1 | 1.0000 1. | 0000 1.0 | 000 1.00  | 000 1.000 | $1.0000\ 1.00$  | 966606   | 0.9979 | 0.9965 | 0.9910 | 0.9679   | 0.9018 C | 0.8113 0 | 0.7463 0 | .4629 0. |
| 0000    | 1.00 | 000 1.000   | 00 1.0000        | 0.00010  | 1.0000   | 1.0000 1 | 1.0000 1. | 0000 1.0 | 000 1.00  | 000 1.000 | $1.0000\ 1.00$  | 0 0.9999 | 0.9997 | 0.9995 | 0.9984 | 0.9930   | 0.9726   | .9371    | 0.6906.0 | .7288 0. |
| 0000    | 1.00 | 000 1.000   | 00 1.0000        | 0.00010  | 1.0000   | 1.0000 1 | 1.0000 1. | 0000 1.0 | 000 1.00  | 000 1.000 | 1.0000 1.0 | 0 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9992   | 0.9962   | 0.9895   | 0.9828 0 | .9282 0. |
| 0000    | 1    | 1 0000 1 0 | 1 000            | 1 0000   | 1        | 1 0000 1 | 1 0000    | 0000     | 1 000     | 100       | ,   | 4 0000   | 1      | ,      | 1      | 0000     | , 0000   | , 0000   | , 0000   | ,        |

| n = 30 | 0 05    | 0   | 0.15   | 1/6    | 0.0    | 0.05   | 0.3    | 1/3      | 0.35  | 0.4      | 0.45     | 5 0      | 0.55     | 90       | 990      | 2/3     | 2.0     | 0.75     | 8 0     | 9/5     | 0.85    | 60       | 0.05     |
|--------|---------|---|--------|--------|--------|--------|--------|----------|---|----------|----------|----------|----------|----------|----------|---------|---------|----------|---------|---------|---------|----------|----------|
| ب<br>ا |         | 70700   | 25000  | 2/2    | 2.00   | 6000   | 0000   | 2/1      | 66.0  |          | 2000     | 2000     | 2000     | 2000     | 2000     | 2/2     |         | 2000     |         | 2/2     | 2000    |          | 0000     |
| x = 0  |         | 0.2146 0.0424 0.0076 0.0042 0.0012 0.0002 0.0000 0.000  | 0.00.0 | 0.0042 | 0.0012 | 0.0002 | 0.000  | 0.000    | 70 0,50000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000 0,0000                                    | 0.000.0  | 7.0000.0 | 7.0000.  | 7.0000.0 | 00000    | 0.000.0  | 0.000.0 | 0.000.0 | 0.000.0  | 0.000.0 | 0.000.0 | 0.000.0 | 0.000.   | 0.000    |
| 1      | 0.553   | 0.5535 0.1837 0.0480 0.0295 0.0105 0.0020 0.0003 0.000  | 0.0480 | 0.0295 | 0.0105 | 0.0020 | 0.0003 |          | $1\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$                       | 0000.0   | 0000.    | ).0000.( | 0000.    | 0000.    | 0.0000   | 0.0000  | 0.0000  | 0.0000   | 0.000.0 | 0.0000  | 0.000.0 | 0000.0   | 0.0000   |
| 2      | 0.812   | 0.8122 0.4114 0.1514 0.1028 0.0442 0.0106 0.0021 0.000  | 0.1514 | 0.1028 | 0.0442 | 0.0106 | 0.0021 | <u></u>  | 0.0003 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000                   | 00000.0  | 00000.   | ).0000.0 | 00000.   | 0.0000.0 | 0.0000.0 | 0.0000  | 0.0000  | 0.0000.0 | 0.0000  | 0.0000  | 0.0000  | 0.000.0  | 0.0000   |
| 3      | 0.9392  | 0.9392 0.6474 0.3217 0.2396 0.1227 0.0374 0.0093 0.003  | 0.3217 | 0.2396 | 0.1227 | 0.0374 | 0.0093 | $\alpha$ | 0.0019 0.0003 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000                   | 0.0003 ( | ).0000 ( | ).0000 ( | ).0000 ( | 00000.   | 0.000.0  | 0.0000  | 0.0000  | 0.000.c  | 0.000.0 | 0.0000  | 0.0000  | 0.0000   | 0.0000   |
| 4      | 0.984   | 0.9844 0.8245 0.5245 0.4243 0.2552 0.0979 0.0302 0.012  | 0.5245 | 0.4243 | 0.2552 | 0.0979 | 0.0302 | 2        | $0.0075\ 0.0015\ 0.0002\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$          | 0.0015 ( | 0.0002 ( | ).0000 ( | 00000.0  | 00000.0  | 0.0000.0 | 0.0000  | 0.0000  | 0.0000   | 0.0000  | 0.0000  | 0.0000  | 0.0000.0 | 0.0000   |
| 5      | 966.0   | 0.9967 0.9268 0.7106 0.6164 0.4275 0.2026 0.0766 0.035  | 0.7106 | 0.6164 | 0.4275 | 0.2026 | 0.0766 | 0.0355   | 5 0.0233 0.0057 0.0011 0.0002 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000                 | 0.0057   | 0.0011   | 0.0002   | ).0000 ( | 00000.   | 0.000.0  | 0.0000  | 0.0000  | 0.000.0  | 0.0000  | 0.0000  | 0.0000  | 0.000.0  | 0.0000.0 |
| 9      | 666.0 9 | 0.9994 0.9742 0.8474 0.7765 0.6070 0.3481 0.1595 0.083  | 0.8474 | 0.7765 | 0.6070 | 0.3481 | 0.1595 | $\infty$ | 0.0586 0.0172 0.0040 0.0007 0.0001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000                   | 0.0172 ( | 0.0040 ( | ).0007 ( | ).0001 ( | 00000.0  | 0.0000.0 | 0.0000  | 0.0000  | 0.00000  | 0.0000  | 0.0000  | 0.0000  | 0.0000   | 0.0000   |
| 7      | 0.9999  | 0.9999 0.9922 0.9302 0.8863 0.7608 0.5143 0.2814 0.166  | 0.9302 | 0.8863 | 0.7608 | 0.5143 | 0.2814 |          | $8\ 0.1238\ 0.0435\ 0.0121\ 0.0026\ 0.0004\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$       | 0.0435 ( | 0.0121 ( | ).0026 ( | ).0004 ( | 00000.0  | 0.0000.0 | 0.0000  | 0.0000  | 0.0000   | 0.0000  | 0.0000  | 0.0000  | 0.000.0  | 0.0000   |
| ∞      | 1.0000  | 1.0000 0.9980 0.9722 0.9494 0.8713 0.6736 0.4315 0.2860 0.2247 0.0940 0.0312 0.0081 0.0016 0.0002 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  | 0.9722 | 0.9494 | 0.8713 | 0.6736 | 0.4315 | 0.2860   | 0.2247  | 0.0940 ( | 0.0312 ( | ).0081 ( | 0.0016   | 0.0002   | 0.0000.0 | 0.0000  | 0.0000  | 0.00000  | 0.0000  | 0.0000  | 0.0000  | 0.0000   | 0.0000   |
| 6      | 1.0000  | $1.0000\ 0.9995\ 0.9903\ 0.9803\ 0.9389\ 0.8034\ 0.5888\ 0.431$   | 0.9903 | 0.9803 | 0.9389 | 0.8034 | 0.5888 | _        | $0.3575\ 0.1763\ 0.0694\ 0.0214\ 0.0050\ 0.0009\ 0.0001\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$          | 0.1763 ( | 0.0694 ( | 0.0214 ( | 0.0050 ( | 0.0000.0 | 0.0001   | 0.0000  | 0.0000  | 0.0000   | 0.0000  | 0.0000  | 0.0000  | 0.000.0  | 0.0000   |
| 10     |         | 1.0000 0.9999 0.9971 0.9933 0.9744 0.8943 0.7304 0.584  | 0.9971 | 0.9933 | 0.9744 | 0.8943 | 0.7304 | 0.5848   | 8 0.5078 0.2915 0.1350 0.0494 0.0138 0.0029 0.0004 0.0002 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000                 | 0.2915   | ).1350 ( | ).0494 ( | 0.0138   | 0.0029   | 0.0004   | 0.0002  | 0.0000  | 0.0000   | 0.000.0 | 0.0000  | 0.0000  | 0.000.0  | 0.0000   |
| 11     | 1.000   | 1.0000 1.0000 0.9992 0.9980 0.9905 0.9493 0.8407 0.723  | 0.9992 | 0.9980 | 0.9905 | 0.9493 | 0.8407 | 6        | $0.6548\ 0.4311\ 0.2327\ 0.1002\ 0.0334\ 0.0083\ 0.0014\ 0.0007\ 0.0002\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$  | 0.4311 ( | ).2327 ( | ).1002 ( | 0.0334 ( | 0.0083   | 0.0014   | 0.0007  | 0.0002  | 0.0000   | 0.0000  | 0.0000  | 0.0000  | 0.000.0  | 0.0000   |
| 12     | 1.0000  | $1.0000\ 1.0000\ 0.9998\ 0.9995\ 0.9969\ 0.9784\ 0.9155\ 0.834$   | 0.9998 | 0.9995 | 0.9969 | 0.9784 | 0.9155 | 0.8340   | $0.07802\ 0.5785\ 0.3592\ 0.1808\ 0.0714\ 0.0212\ 0.0045\ 0.0025\ 0.0006\ 0.0001\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000\ 0.0000$ | 0.5785 ( | 3592 (   | ).1808 ( | 0.0714 ( | 0.0212   | 0.0045   | 0.0025  | 0.0006  | 0.0001   | 0.0000  | 0.0000  | 0.0000  | 0.000.0  | 0.0000   |
| 13     | 1.0000  | $1.0000\ 1.0000\ 1.0000\ 0.9999\ 0.9991\ 0.9918\ 0.9599\ 0.910$   | 1.0000 | 0.9999 | 0.9991 | 0.9918 | 0.9599 | 0.9102   | 2 0.8737 0.7145 0.5025 0.2923 0.1356 0.0481 0.0124 0.0072 0.0021 0.0002 0.0000 0.0000 0.0000 0.0000 0.0000                        | 0.7145 ( | ).5025 ( | ).2923 ( | ).1356 ( | 0.0481   | 0.0124   | 0.0072  | 0.0021  | 0.0002   | 0.0000  | 0.0000  | 0.0000  | 0.0000   | 0.0000   |
| 14     |         | $1.0000\ 1.0000\ 1.0000\ 1.0000\ 0.9998\ 0.9973\ 0.9831\ 0.956$   | 1.0000 | 1.0000 | 0.9998 | 0.9973 | 0.9831 | 2        | 0.9348 0.8246 0.6448 0.4278 0.2309 0.0971 0.0301 0.0188 0.0064 0.0008 0.0001 0.0000 0.0000 0.0000 0.0000                          | ).8246 ( | ).6448 ( | ).4278 ( | ).2309 ( | 0.0971   | 0.0301   | 0.0188  | 0.0064  | 0.0008   | 0.0001  | 0.0000  | 0.0000  | 0.0000.0 | 0.0000   |
| 15     |         | 1.0000 1.0000 1.0000 1.0000 0.9999 0.9992 0.9936 0.981  | 1.0000 | 1.0000 | 0.9999 | 0.9992 | 0.9936 | 2        | $0.9699\ 0.9029\ 0.7691\ 0.5722\ 0.3552\ 0.1754\ 0.0652\ 0.0435\ 0.0169\ 0.0027\ 0.0002\ 0.0000\ 0.0000\ 0.0000\ 0.0000$          | 0.9029 ( | ).7691 ( | ).5722 ( | ).3552 ( | ).1754 ( | 0.0652   | 0.0435  | 0.0169  | 0.0027   | 0.0002  | 0.0000  | 0.0000  | 0.000.0  | 0.0000   |
| 16     |         | 1.0000 1.0000 1.0000 1.0000 1.0000 0.9998 0.9979 0.992  | 1.0000 | 1.0000 | 1.0000 | 0.9998 | 0.9979 | $\infty$ | $0.9876\ 0.9519\ 0.8644\ 0.7077\ 0.4975\ 0.2855\ 0.1263\ 0.0898\ 0.0401\ 0.0082\ 0.0009\ 0.0001\ 0.0000\ 0.0000\ 0.0000$          | 0.9519 ( | ).8644 ( | ) 7707.( | ).4975 ( | ).2855 ( | 0.1263   | 0.0898  | 0.0401  | 0.0082   | 0.0000  | 0.0001  | 0.0000  | 0.000.0  | 0.0000   |
| 17     | 1.0000  | 1.0000 1.0000 1.0000 1.0000 1.0000 0.9999 0.9994 0.997  | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9994 |          | 5 0.9955 0.9788 0.9286 0.8192 0.6408 0.4215 0.2198 0.1660 0.0845 0.0216 0.0031 0.0005 0.0002 0.0000 0.0000                        | ).9788 ( | ).9286 ( | ).8192 ( | ).6408 ( | 0.4215   | 0.2198   | 0.1660  | 0.0845  | 0.0216   | 0.0031  | 0.0005  | 0.0002  | 0.000.0  | 0.0000   |
| 18     |         | 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9998 0.999  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9998 |          | 3 0.9986 0.9917 0.9666 0.8998 0.7673 0.5689 0.3452 0.2761 0.1593 0.0507 0.0095 0.0020 0.0008 0.0000 0.0000                        | 0.9917   | ).9666 ( | ) 8668.( | ).7673 ( | 0.5689 ( | 0.3452   | 0.2761  | 0.1593  | 0.0507   | 0.0095  | 0.0020  | 0.0008  | 0.000.0  | 0.0000   |
| 19     |         | 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.999  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | $\infty$ | $0.9996\ 0.9971\ 0.9862\ 0.9506\ 0.8650\ 0.7085\ 0.4922\ 0.4152\ 0.2696\ 0.1057\ 0.0256\ 0.0067\ 0.0029\ 0.0001\ 0.0000$          | ).9971 ( | ).9862 ( | ).9506 ( | ).8650 ( | 0.7085   | 0.4922   | 0.4152  | 0.2696  | 0.1057   | 0.0256  | 0.0067  | 0.0029  | 0.0001   | 0.0000   |
| 20     |         | 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9999 0.9991 0.9950 0.9786 0.9306 0.8237 0.6425 0.5683 0.4112 0.1966 0.0611 0.0197 0.0097 0.0005 0.0000  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 0.9999  | ).9991 ( | ).9950 ( | ) 98/6′( | ).9306 ( | ).8237   | 0.6425   | 0.5683  | 0.4112  | 0.1966   | 0.0611  | 0.0197  | 0.0097  | 0.0005   | 0.0000   |
| 21     | 1.000   | $1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 0.9998\ 0.9984\ 0.9919\ 0.9688\ 0.9060\ 0.7753\ 0.7140\ 0.5685\ 0.3264\ 0.1287\ 0.0506\ 0.0278\ 0.0020\ 0.0000$  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 1.0000 (  | ) 8666.0 | ).9984 ( | ).9919 ( | ).9688 ( | ).9060   | 0.7753   | 0.7140  | 0.5685  | 0.3264   | 0.1287  | 0.0506  | 0.0278  | 0.0020   | 0.0000   |
| 22     | 1.000   | 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 0.9996 0.9974 0.9879 0.9565 0.8762 0.8332 0.7186 0.4857 0.2392 0.1137 0.0698 0.0078 0.0001  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 1.0000  | 1.0000 ( | ) 9666′  | ).9974 ( | ) 6286.( | ).9565 ( | 0.8762   | 0.8332  | 0.7186  | 0.4857   | 0.2392  | 0.1137  | 0.0698  | 0.0078   | 0.0001   |
| 23     |         | $1.0000\ 1.00$  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 1.0000  | 1.0000 ( | ) 6666.( | ).9993 ( | ) 0966.( | ).9828 ( | 0.9414   | 0.9162  | 0.8405  | 0.6519   | 0.3930  | 0.2235  | 0.1526  | 0.0258   | 0.0006   |
| 24     | 1.0000  | $1.0000\ 1.00$  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 1.0000  | 1.0000   | 1.0000 ( | ) 8666.( | ) 6866.( | ).9943 ( | 1926.0   | 0.9645  | 0.9234  | 0.7974   | 0.5725  | 0.3836  | 0.2894  | 0.0732   | 0.0033   |
| 25     | 1.000   | $1.0000\ 1.00$  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 1.0000  | 1.0000   | 1.0000   | 1.0000   | ) 8666'( | 3.9985   | 0.9925   | 0.9878  | 8696.0  | 0.9021   | 0.7448  | 0.5757  | 0.4755  | 0.1755   | 0.0156   |
| 26     |         | 1.0000 1.0 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 1.0000  | 1.0000   | 1.0000   | 1.0000.1 | 1.0000 ( | 7666.(   | 0.9981   | 0.9967  | 0.9907  | 0.9626   | 0.8773  | 0.7604  | 0.6783  | 0.3526   | 0.0608   |
| 27     | 1.000   | $1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 1.0000\ 0.9993\ 0.9993\ 0.9994\ 0.9558\ 0.8972\ 0.8486\ 0.5886\ 0.1878$  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 1.0000  | 1.0000   | 1.0000   | 1.0000.1 | 1.0000.1 | 1.0000 ( | 0.9997   | 0.9993  | 0.9979  | 0.9894   | 0.9558  | 0.8972  | 0.8486  | 0.5886   | 0.1878   |
| 28     | 1.0000  | $1.0000\ 1.00$  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 1.0000  | 1.0000   | 1.0000   | 1.0000.1 | 1.0000.1 | 0000.1   | 1.0000   | 0.9999  | 0.9997  | 0.9980   | 0.9895  | 0.9705  | 0.9520  | 0.8163   | 0.4465   |
| 29     |         | 1.0000 1.0 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 1.0000  | 1.0000   | 1.0000   | 1.0000   | 1.0000   | 0000.1   | 1.0000   | 1.0000  | 1.0000  | 0.9998   | 0.9988  | 0.9958  | 0.9924  | 0.9576   | 0.7854   |
| 30     |         | $1.0000\ 1.00$  | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000   | 1.0000  | 1.0000   | 1.0000   | 0000.1   | .0000.1  | 1.0000   | 1.0000   | 1.0000  | 1.0000  | 1.0000   | 1.0000  | 1.0000  | 1.0000  | 1.0000   | 1.0000   |

# **CUMULATIVE POISSON PROBABILITIES**

| _               |        |        |        |        |        |        |        |        |        |        |
|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| λ               |        | 0.01   | 0.02   | 0.03   | 0.04   | 0.05   | 0.06   | 0.07   | 0.08   | 0.09   |
| x = 0           |        | 0.9900 | 0.9802 | 0.9704 | 0.9608 | 0.9512 | 0.9418 | 0.9324 | 0.9231 | 0.9139 |
| 1               |        | 1.0000 | 0.9998 | 0.9996 | 0.9992 | 0.9988 | 0.9983 | 0.9977 | 0.9970 | 0.9962 |
| 2               |        | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9999 | 0.9999 |
| 3               |        | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 3               |        | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
|                 |        |        |        |        |        |        |        |        |        |        |
| λ               |        | 0.10   | 0.20   | 0.30   | 0.40   | 0.50   | 0.60   | 0.70   | 0.80   | 0.90   |
| x = 0           |        | 0.9048 | 0.8187 | 0.7408 | 0.6703 | 0.6065 | 0.5488 | 0.4966 | 0.4493 | 0.4066 |
| 1               |        | 0.9953 | 0.9825 | 0.9631 | 0.9384 | 0.9098 | 0.8781 | 0.8442 | 0.8088 | 0.7725 |
| 2               |        | 0.9998 | 0.9989 | 0.9964 | 0.9921 | 0.9856 | 0.9769 | 0.9659 | 0.9526 | 0.9371 |
| 3               |        | 1.0000 | 0.9999 | 0.9997 | 0.9992 | 0.9982 | 0.9966 | 0.9942 | 0.9909 | 0.9865 |
| 4               |        | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9998 | 0.9996 | 0.9992 | 0.9986 | 0.9977 |
|                 |        |        |        |        |        |        |        |        |        |        |
| 5               |        | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9998 | 0.9997 |
| 6               |        | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
|                 |        |        |        |        |        |        |        |        |        |        |
| λ               | 1.00   | 1.10   | 1.20   | 1.30   | 1.40   | 1.50   | 1.60   | 1.70   | 1.80   | 1.90   |
| x = 0           | 0.3679 | 0.3329 | 0.3012 | 0.2725 | 0.2466 | 0.2231 | 0.2019 | 0.1827 | 0.1653 | 0.1496 |
| 1               | 0.7358 | 0.6990 | 0.6626 | 0.6268 | 0.5918 | 0.5578 | 0.5249 | 0.4932 | 0.4628 | 0.4337 |
| 2               | 0.9197 | 0.9004 | 0.8795 | 0.8571 | 0.8335 | 0.8088 | 0.7834 | 0.7572 | 0.7306 | 0.7037 |
| 3               | 0.9810 | 0.9743 | 0.9662 | 0.9569 | 0.9463 | 0.9344 | 0.9212 | 0.9068 | 0.8913 | 0.8747 |
| 4               |        |        |        | 0.9893 |        |        |        |        |        |        |
|                 | 0.9963 | 0.9946 | 0.9923 |        | 0.9857 | 0.9814 | 0.9763 | 0.9704 | 0.9636 | 0.9559 |
| 5               | 0.9994 | 0.9990 | 0.9985 | 0.9978 | 0.9968 | 0.9955 | 0.9940 | 0.9920 | 0.9896 | 0.9868 |
| 6               | 0.9999 | 0.9999 | 0.9997 | 0.9996 | 0.9994 | 0.9991 | 0.9987 | 0.9981 | 0.9974 | 0.9966 |
| 7               | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9999 | 0.9998 | 0.9997 | 0.9996 | 0.9994 | 0.9992 |
| 8               | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9999 | 0.9998 |
| 9               | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
|                 |        |        |        |        |        |        |        |        |        |        |
| λ               | 2.00   | 2.10   | 2.20   | 2.30   | 2.40   | 2.50   | 2.60   | 2.70   | 2.80   | 2.90   |
| x = 0           | 0.1353 | 0.1225 | 0.1108 | 0.1003 | 0.0907 | 0.0821 | 0.0743 | 0.0672 | 0.0608 | 0.0550 |
| $\frac{x-5}{1}$ | 0.4060 | 0.3796 | 0.3546 | 0.3309 | 0.3084 | 0.2873 | 0.2674 | 0.2487 | 0.2311 | 0.2146 |
| 2               | 0.4000 | 0.6496 | 0.6227 | 0.5960 | 0.5697 | 0.5438 | 0.2074 | 0.4936 | 0.4695 | 0.4460 |
|                 |        |        |        |        |        |        |        |        |        |        |
| 3               | 0.8571 | 0.8386 | 0.8194 | 0.7993 | 0.7787 | 0.7576 | 0.7360 | 0.7141 | 0.6919 | 0.6696 |
| 4               | 0.9473 | 0.9379 | 0.9275 | 0.9162 | 0.9041 | 0.8912 | 0.8774 | 0.8629 | 0.8477 | 0.8318 |
| 5               | 0.9834 | 0.9796 | 0.9751 | 0.9700 | 0.9643 | 0.9580 | 0.9510 | 0.9433 | 0.9349 | 0.9258 |
| 6               | 0.9955 | 0.9941 | 0.9925 | 0.9906 | 0.9884 | 0.9858 | 0.9828 | 0.9794 | 0.9756 | 0.9713 |
| 7               | 0.9989 | 0.9985 | 0.9980 | 0.9974 | 0.9967 | 0.9958 | 0.9947 | 0.9934 | 0.9919 | 0.9901 |
| 8               | 0.9998 | 0.9997 | 0.9995 | 0.9994 | 0.9991 | 0.9989 | 0.9985 | 0.9981 | 0.9976 | 0.9969 |
| 9               | 1.0000 | 0.9999 | 0.9999 | 0.9999 | 0.9998 | 0.9997 | 0.9996 | 0.9995 | 0.9993 | 0.9991 |
| 10              | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9999 | 0.9999 | 0.9998 | 0.9998 |
| 11              | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 |
| 12              | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 12              | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 2               | 2.00   | 2.10   | 2.20   | 2.20   | 2.40   | 2.50   | 2.60   | 2.70   | 2.00   | 2.00   |
| λ               | 3.00   | 3.10   | 3.20   | 3.30   | 3.40   | 3.50   | 3.60   | 3.70   | 3.80   | 3.90   |
| x = 0           | 0.0498 | 0.0450 | 0.0408 | 0.0369 | 0.0334 | 0.0302 | 0.0273 | 0.0247 | 0.0224 | 0.0202 |
| 1               | 0.1991 | 0.1847 | 0.1712 | 0.1586 | 0.1468 | 0.1359 | 0.1257 | 0.1162 | 0.1074 | 0.0992 |
| 2               | 0.4232 | 0.4012 | 0.3799 | 0.3594 | 0.3397 | 0.3208 | 0.3027 | 0.2854 | 0.2689 | 0.2531 |
| 3               | 0.6472 | 0.6248 | 0.6025 | 0.5803 | 0.5584 | 0.5366 | 0.5152 | 0.4942 | 0.4735 | 0.4532 |
| 4               | 0.8153 | 0.7982 | 0.7806 | 0.7626 | 0.7442 | 0.7254 | 0.7064 | 0.6872 | 0.6678 | 0.6484 |
| 5               | 0.9161 | 0.9057 | 0.8946 | 0.8829 | 0.8705 | 0.8576 | 0.8441 | 0.8301 | 0.8156 | 0.8006 |
| 6               | 0.9665 | 0.9612 | 0.9554 | 0.9490 | 0.9421 | 0.9347 | 0.9267 | 0.9182 | 0.9091 | 0.8995 |
| 7               | 0.9881 | 0.9858 | 0.9832 | 0.9802 | 0.9769 | 0.9733 | 0.9692 | 0.9648 | 0.9599 | 0.9546 |
| 8               | 0.9962 | 0.9953 | 0.9943 | 0.9931 | 0.9917 | 0.9901 | 0.9883 | 0.9863 | 0.9840 | 0.9815 |
|                 |        |        |        |        |        |        |        |        |        |        |
| 9               | 0.9989 | 0.9986 | 0.9982 | 0.9978 | 0.9973 | 0.9967 | 0.9960 | 0.9952 | 0.9942 | 0.9931 |
| 10              | 0.9997 | 0.9996 | 0.9995 | 0.9994 | 0.9992 | 0.9990 | 0.9987 | 0.9984 | 0.9981 | 0.9977 |
| 11              | 0.9999 | 0.9999 | 0.9999 | 0.9998 | 0.9998 | 0.9997 | 0.9996 | 0.9995 | 0.9994 | 0.9993 |
| 12              | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9998 | 0.9998 |
| 13              | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 |
| 14              | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
|                 |        |        |        |        |        |        |        |        |        |        |

# **CUMULATIVE POISSON PROBABILITIES**

| λ     | 4.00   | 4.10   | 4.20   | 4.30   | 4.40   | 4.50   | 4.60   | 4.70   | 4.80   | 4.90   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| x = 0 | 0.0183 | 0.0166 | 0.0150 | 0.0136 | 0.0123 | 0.0111 | 0.0101 | 0.0091 | 0.0082 | 0.0074 |
| 1     | 0.0916 | 0.0845 | 0.0780 | 0.0719 | 0.0663 | 0.0611 | 0.0563 | 0.0518 | 0.0477 | 0.0439 |
| 2     | 0.2381 | 0.2238 | 0.2102 | 0.1974 | 0.1851 | 0.1736 | 0.1626 | 0.1523 | 0.1425 | 0.1333 |
| 3     | 0.4335 | 0.4142 | 0.3954 | 0.3772 | 0.3594 | 0.3423 | 0.3257 | 0.3097 | 0.2942 | 0.2793 |
| 4     | 0.6288 | 0.6093 | 0.5898 | 0.5704 | 0.5512 | 0.5321 | 0.5132 | 0.4946 | 0.4763 | 0.4582 |
| 5     | 0.7851 | 0.7693 | 0.7531 | 0.7367 | 0.7199 | 0.7029 | 0.6858 | 0.6684 | 0.6510 | 0.6335 |
| 6     | 0.8893 | 0.8786 | 0.8675 | 0.8558 | 0.8436 | 0.8311 | 0.8180 | 0.8046 | 0.7908 | 0.7767 |
| 7     | 0.9489 | 0.9427 | 0.9361 | 0.9290 | 0.9214 | 0.9134 | 0.9049 | 0.8960 | 0.8867 | 0.8769 |
| 8     | 0.9786 | 0.9755 | 0.9721 | 0.9683 | 0.9642 | 0.9597 | 0.9549 | 0.9497 | 0.9442 | 0.9382 |
| 9     | 0.9919 | 0.9905 | 0.9889 | 0.9871 | 0.9851 | 0.9829 | 0.9805 | 0.9778 | 0.9749 | 0.9717 |
| 10    | 0.9972 | 0.9966 | 0.9959 | 0.9952 | 0.9943 | 0.9933 | 0.9922 | 0.9910 | 0.9896 | 0.9880 |
| 11    | 0.9991 | 0.9989 | 0.9986 | 0.9983 | 0.9980 | 0.9976 | 0.9971 | 0.9966 | 0.9960 | 0.9953 |
| 12    | 0.9997 | 0.9997 | 0.9996 | 0.9995 | 0.9993 | 0.9992 | 0.9990 | 0.9988 | 0.9986 | 0.9983 |
| 13    | 0.9999 | 0.9999 | 0.9999 | 0.9998 | 0.9998 | 0.9997 | 0.9997 | 0.9996 | 0.9995 | 0.9994 |
| 14    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9999 | 0.9998 |
| 15    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 |
| 16    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |

| λ     | 5.00   | 5.50   | 6.00   | 6.50   | 7.00   | 7.50   | 8.00   | 8.50   | 9.00   | 9.50   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| x = 0 | 0.0067 | 0.0041 | 0.0025 | 0.0015 | 0.0009 | 0.0006 | 0.0003 | 0.0002 | 0.0001 | 0.0001 |
| 1     | 0.0404 | 0.0266 | 0.0174 | 0.0113 | 0.0073 | 0.0047 | 0.0030 | 0.0019 | 0.0012 | 0.0008 |
| 2     | 0.1247 | 0.0884 | 0.0620 | 0.0430 | 0.0296 | 0.0203 | 0.0138 | 0.0093 | 0.0062 | 0.0042 |
| 3     | 0.2650 | 0.2017 | 0.1512 | 0.1118 | 0.0818 | 0.0591 | 0.0424 | 0.0301 | 0.0212 | 0.0149 |
| 4     | 0.4405 | 0.3575 | 0.2851 | 0.2237 | 0.1730 | 0.1321 | 0.0996 | 0.0744 | 0.0550 | 0.0403 |
| 5     | 0.6160 | 0.5289 | 0.4457 | 0.3690 | 0.3007 | 0.2414 | 0.1912 | 0.1496 | 0.1157 | 0.0885 |
| 6     | 0.7622 | 0.6860 | 0.6063 | 0.5265 | 0.4497 | 0.3782 | 0.3134 | 0.2562 | 0.2068 | 0.1649 |
| 7     | 0.8666 | 0.8095 | 0.7440 | 0.6728 | 0.5987 | 0.5246 | 0.4530 | 0.3856 | 0.3239 | 0.2687 |
| 8     | 0.9319 | 0.8944 | 0.8472 | 0.7916 | 0.7291 | 0.6620 | 0.5925 | 0.5231 | 0.4557 | 0.3918 |
| 9     | 0.9682 | 0.9462 | 0.9161 | 0.8774 | 0.8305 | 0.7764 | 0.7166 | 0.6530 | 0.5874 | 0.5218 |
| 10    | 0.9863 | 0.9747 | 0.9574 | 0.9332 | 0.9015 | 0.8622 | 0.8159 | 0.7634 | 0.7060 | 0.6453 |
| 11    | 0.9945 | 0.9890 | 0.9799 | 0.9661 | 0.9467 | 0.9208 | 0.8881 | 0.8487 | 0.8030 | 0.7520 |
| 12    | 0.9980 | 0.9955 | 0.9912 | 0.9840 | 0.9730 | 0.9573 | 0.9362 | 0.9091 | 0.8758 | 0.8364 |
| 13    | 0.9993 | 0.9983 | 0.9964 | 0.9929 | 0.9872 | 0.9784 | 0.9658 | 0.9486 | 0.9261 | 0.8981 |
| 14    | 0.9998 | 0.9994 | 0.9986 | 0.9970 | 0.9943 | 0.9897 | 0.9827 | 0.9726 | 0.9585 | 0.9400 |
| 15    | 0.9999 | 0.9998 | 0.9995 | 0.9988 | 0.9976 | 0.9954 | 0.9918 | 0.9862 | 0.9780 | 0.9665 |
| 16    | 1.0000 | 0.9999 | 0.9998 | 0.9996 | 0.9990 | 0.9980 | 0.9963 | 0.9934 | 0.9889 | 0.9823 |
| 17    | 1.0000 | 1.0000 | 0.9999 | 0.9998 | 0.9996 | 0.9992 | 0.9984 | 0.9970 | 0.9947 | 0.9911 |
| 18    | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9999 | 0.9997 | 0.9993 | 0.9987 | 0.9976 | 0.9957 |
| 19    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9997 | 0.9995 | 0.9989 | 0.9980 |
| 20    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9998 | 0.9996 | 0.9991 |
| 21    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9998 | 0.9996 |
| 22    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9999 |
| 23    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 |
| 24    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |

# **CUMULATIVE POISSON PROBABILITIES**

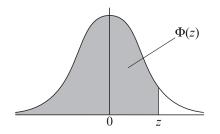
| λ     | 10.00  | 11.00  | 12.00  | 13.00  | 14.00  | 15.00  | 16.00  | 17.00  | 18.00  | 19.00  |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| x = 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 1     | 0.0005 | 0.0002 | 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2     | 0.0028 | 0.0012 | 0.0005 | 0.0002 | 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 3     | 0.0103 | 0.0049 | 0.0023 | 0.0011 | 0.0005 | 0.0002 | 0.0001 | 0.0000 | 0.0000 | 0.0000 |
| 4     | 0.0293 | 0.0151 | 0.0076 | 0.0037 | 0.0018 | 0.0009 | 0.0004 | 0.0002 | 0.0001 | 0.0000 |
| 5     | 0.0671 | 0.0375 | 0.0203 | 0.0107 | 0.0055 | 0.0028 | 0.0014 | 0.0007 | 0.0003 | 0.0002 |
| 6     | 0.1301 | 0.0786 | 0.0458 | 0.0259 | 0.0142 | 0.0076 | 0.0040 | 0.0021 | 0.0010 | 0.0005 |
| 7     | 0.2202 | 0.1432 | 0.0895 | 0.0540 | 0.0316 | 0.0180 | 0.0100 | 0.0054 | 0.0029 | 0.0015 |
| 8     | 0.3328 | 0.2320 | 0.1550 | 0.0998 | 0.0621 | 0.0374 | 0.0220 | 0.0126 | 0.0071 | 0.0039 |
| 9     | 0.4579 | 0.3405 | 0.2424 | 0.1658 | 0.1094 | 0.0699 | 0.0433 | 0.0261 | 0.0154 | 0.0089 |
| 10    | 0.5830 | 0.4599 | 0.3472 | 0.2517 | 0.1757 | 0.1185 | 0.0774 | 0.0491 | 0.0304 | 0.0183 |
| 11    | 0.6968 | 0.5793 | 0.4616 | 0.3532 | 0.2600 | 0.1848 | 0.1270 | 0.0847 | 0.0549 | 0.0347 |
| 12    | 0.7916 | 0.6887 | 0.5760 | 0.4631 | 0.3585 | 0.2676 | 0.1931 | 0.1350 | 0.0917 | 0.0606 |
| 13    | 0.8645 | 0.7813 | 0.6815 | 0.5730 | 0.4644 | 0.3632 | 0.2745 | 0.2009 | 0.1426 | 0.0984 |
| 14    | 0.9165 | 0.8540 | 0.7720 | 0.6751 | 0.5704 | 0.4657 | 0.3675 | 0.2808 | 0.2081 | 0.1497 |
| 15    | 0.9513 | 0.9074 | 0.8444 | 0.7636 | 0.6694 | 0.5681 | 0.4667 | 0.3715 | 0.2867 | 0.2148 |
| 16    | 0.9730 | 0.9441 | 0.8987 | 0.8355 | 0.7559 | 0.6641 | 0.5660 | 0.4677 | 0.3751 | 0.2920 |
| 17    | 0.9857 | 0.9678 | 0.9370 | 0.8905 | 0.8272 | 0.7489 | 0.6593 | 0.5640 | 0.4686 | 0.3784 |
| 18    | 0.9928 | 0.9823 | 0.9626 | 0.9302 | 0.8826 | 0.8195 | 0.7423 | 0.6550 | 0.5622 | 0.4695 |
| 19    | 0.9965 | 0.9907 | 0.9787 | 0.9573 | 0.9235 | 0.8752 | 0.8122 | 0.7363 | 0.6509 | 0.5606 |
| 20    | 0.9984 | 0.9953 | 0.9884 | 0.9750 | 0.9521 | 0.9170 | 0.8682 | 0.8055 | 0.7307 | 0.6472 |
| 21    | 0.9993 | 0.9977 | 0.9939 | 0.9859 | 0.9712 | 0.9469 | 0.9108 | 0.8615 | 0.7991 | 0.7255 |
| 22    | 0.9997 | 0.9990 | 0.9970 | 0.9924 | 0.9833 | 0.9673 | 0.9418 | 0.9047 | 0.8551 | 0.7931 |
| 23    | 0.9999 | 0.9995 | 0.9985 | 0.9960 | 0.9907 | 0.9805 | 0.9633 | 0.9367 | 0.8989 | 0.8490 |
| 24    | 1.0000 | 0.9998 | 0.9993 | 0.9980 | 0.9950 | 0.9888 | 0.9777 | 0.9594 | 0.9317 | 0.8933 |
| 25    | 1.0000 | 0.9999 | 0.9997 | 0.9990 | 0.9974 | 0.9938 | 0.9869 | 0.9748 | 0.9554 | 0.9269 |
| 26    | 1.0000 | 1.0000 | 0.9999 | 0.9995 | 0.9987 | 0.9967 | 0.9925 | 0.9848 | 0.9718 | 0.9514 |
| 27    | 1.0000 | 1.0000 | 0.9999 | 0.9998 | 0.9994 | 0.9983 | 0.9959 | 0.9912 | 0.9827 | 0.9687 |
| 28    | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9997 | 0.9991 | 0.9978 | 0.9950 | 0.9897 | 0.9805 |
| 29    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9996 | 0.9989 | 0.9973 | 0.9941 | 0.9882 |
| 30    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9998 | 0.9994 | 0.9986 | 0.9967 | 0.9930 |
| 31    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9997 | 0.9993 | 0.9982 | 0.9960 |
| 32    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9996 | 0.9990 | 0.9978 |
| 33    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9998 | 0.9995 | 0.9988 |
| 34    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9998 | 0.9994 |
| 35    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9997 |
| 36    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 | 0.9998 |
| 37    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9999 |
| 38    | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |

# THE NORMAL DISTRIBUTION FUNCTION

If Z has a normal distribution with mean 0 and variance 1 then, for each value of z, the table gives the value of  $\Phi(z)$ , where

$$\Phi(z) = P(Z \leq z).$$

For negative values of z use  $\Phi(-z) = 1 - \Phi(z)$ .



| z   | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 1 | 2 | 3  |    | 5<br>AD |    | 7  | 8  | 9  |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|---|----|----|---------|----|----|----|----|
| 0.0 | 0.5000 | 0.5040 | 0.5080 | 0.5120 | 0.5160 | 0.5199 | 0.5239 | 0.5279 | 0.5319 | 0.5359 | 4 | 8 | 12 | 16 | 20      | 24 | 28 | 32 | 36 |
| 0.1 | 0.5398 | 0.5438 | 0.5478 | 0.5517 | 0.5557 | 0.5596 | 0.5636 | 0.5675 | 0.5714 | 0.5753 | 4 | 8 | 12 | 16 | 20      | 24 | 28 | 32 | 36 |
| 0.2 | 0.5793 | 0.5832 | 0.5871 | 0.5910 | 0.5948 | 0.5987 | 0.6026 | 0.6064 | 0.6103 | 0.6141 | 4 | 8 | 12 | 15 | 19      | 23 | 27 | 31 | 35 |
| 0.3 | 0.6179 | 0.6217 | 0.6255 | 0.6293 | 0.6331 | 0.6368 | 0.6406 | 0.6443 | 0.6480 | 0.6517 | 4 | 7 | 11 | 15 | 19      | 22 | 26 | 30 | 34 |
| 0.4 | 0.6554 | 0.6591 | 0.6628 | 0.6664 | 0.6700 | 0.6736 | 0.6772 | 0.6808 | 0.6844 | 0.6879 | 4 | 7 | 11 | 14 | 18      | 22 | 25 | 29 | 32 |
| 0.5 | 0.6915 | 0.6950 | 0.6985 | 0.7019 | 0.7054 | 0.7088 | 0.7123 | 0.7157 | 0.7190 | 0.7224 | 3 | 7 | 10 | 14 | 17      | 20 | 24 | 27 | 31 |
| 0.6 | 0.7257 | 0.7291 | 0.7324 | 0.7357 | 0.7389 | 0.7422 | 0.7454 | 0.7486 | 0.7517 | 0.7549 | 3 | 7 | 10 | 13 | 16      | 19 | 23 | 26 | 29 |
| 0.7 | 0.7580 | 0.7611 | 0.7642 | 0.7673 | 0.7704 | 0.7734 | 0.7764 | 0.7794 | 0.7823 | 0.7852 | 3 | 6 | 9  | 12 | 15      | 18 | 21 | 24 | 27 |
| 0.8 | 0.7881 | 0.7910 | 0.7939 | 0.7967 | 0.7995 | 0.8023 | 0.8051 | 0.8078 | 0.8106 | 0.8133 | 3 | 5 | 8  | 11 | 14      | 16 | 19 | 22 | 25 |
| 0.9 | 0.8159 | 0.8186 | 0.8212 | 0.8238 | 0.8264 | 0.8289 | 0.8315 | 0.8340 | 0.8365 | 0.8389 | 3 | 5 | 8  | 10 | 13      | 15 | 18 | 20 | 23 |
| 1.0 | 0.8413 | 0.8438 | 0.8461 | 0.8485 | 0.8508 | 0.8531 | 0.8554 | 0.8577 | 0.8599 | 0.8621 | 2 | 5 | 7  | 9  | 12      | 14 | 16 | 19 | 21 |
| 1.1 | 0.8643 | 0.8665 | 0.8686 | 0.8708 | 0.8729 | 0.8749 | 0.8770 | 0.8790 | 0.8810 | 0.8830 | 2 | 4 | 6  | 8  | 10      | 12 | 14 | 16 | 18 |
| 1.2 | 0.8849 | 0.8869 | 0.8888 | 0.8907 | 0.8925 | 0.8944 | 0.8962 | 0.8980 | 0.8997 | 0.9015 | 2 | 4 | 6  | 7  | 9       | 11 | 13 | 15 | 17 |
| 1.3 | 0.9032 | 0.9049 | 0.9066 | 0.9082 | 0.9099 | 0.9115 | 0.9131 | 0.9147 | 0.9162 | 0.9177 | 2 | 3 | 5  | 6  | 8       | 10 | 11 | 13 | 14 |
| 1.4 | 0.9192 | 0.9207 | 0.9222 | 0.9236 | 0.9251 | 0.9265 | 0.9279 | 0.9292 | 0.9306 | 0.9319 | 1 | 3 | 4  | 6  | 7       | 8  | 10 | 11 | 13 |
| 1.5 | 0.9332 | 0.9345 | 0.9357 | 0.9370 | 0.9382 | 0.9394 | 0.9406 | 0.9418 | 0.9429 | 0.9441 | 1 | 2 | 4  | 5  | 6       | 7  | 8  | 10 | 11 |
| 1.6 | 0.9452 | 0.9463 | 0.9474 | 0.9484 | 0.9495 | 0.9505 | 0.9515 | 0.9525 | 0.9535 | 0.9545 | 1 | 2 | 3  | 4  | 5       | 6  | 7  | 8  | 9  |
| 1.7 | 0.9554 | 0.9564 | 0.9573 | 0.9582 | 0.9591 | 0.9599 | 0.9608 | 0.9616 | 0.9625 | 0.9633 | 1 | 2 | 3  | 4  | 4       | 5  | 6  | 7  | 8  |
| 1.8 | 0.9641 | 0.9649 | 0.9656 | 0.9664 | 0.9671 | 0.9678 | 0.9686 | 0.9693 | 0.9699 | 0.9706 | 1 | 1 | 2  | 3  | 4       | 4  | 5  | 6  | 6  |
| 1.9 | 0.9713 | 0.9719 | 0.9726 | 0.9732 | 0.9738 | 0.9744 | 0.9750 | 0.9756 | 0.9761 | 0.9767 | 1 | 1 | 2  | 2  | 3       | 4  | 4  | 5  | 5  |
| 2.0 | 0.9772 | 0.9778 | 0.9783 | 0.9788 | 0.9793 | 0.9798 | 0.9803 | 0.9808 | 0.9812 | 0.9817 | 0 | 1 | 1  | 2  | 2       | 3  | 3  | 4  | 4  |
| 2.1 | 0.9821 | 0.9826 | 0.9830 | 0.9834 | 0.9838 | 0.9842 | 0.9846 | 0.9850 | 0.9854 | 0.9857 | 0 | 1 | 1  | 2  | 2       | 2  | 3  | 3  | 4  |
| 2.2 | 0.9861 | 0.9864 | 0.9868 | 0.9871 | 0.9875 | 0.9878 | 0.9881 | 0.9884 | 0.9887 | 0.9890 | 0 | 1 | 1  | 1  | 2       | 2  | 2  | 3  | 3  |
| 2.3 | 0.9893 | 0.9896 | 0.9898 | 0.9901 | 0.9904 | 0.9906 | 0.9909 | 0.9911 | 0.9913 | 0.9916 | 0 | 1 | 1  | 1  | 1       | 2  | 2  | 2  | 2  |
| 2.4 | 0.9918 | 0.9920 | 0.9922 | 0.9925 | 0.9927 | 0.9929 | 0.9931 | 0.9932 | 0.9934 | 0.9936 | 0 | 0 | 1  | 1  | 1       | 1  | 1  | 2  | 2  |
| 2.5 | 0.9938 | 0.9940 | 0.9941 | 0.9943 | 0.9945 | 0.9946 | 0.9948 | 0.9949 | 0.9951 | 0.9952 | 0 | 0 | 0  | 1  | 1       | 1  | 1  | 1  | 1  |
| 2.6 | 0.9953 | 0.9955 | 0.9956 | 0.9957 | 0.9959 | 0.9960 | 0.9961 | 0.9962 | 0.9963 | 0.9964 | 0 | 0 | 0  | 0  | 1       | 1  | 1  | 1  | 1  |
| 2.7 | 0.9965 | 0.9966 | 0.9967 | 0.9968 | 0.9969 | 0.9970 | 0.9971 | 0.9972 | 0.9973 | 0.9974 | 0 | 0 | 0  | 0  | 0       | 1  | 1  | 1  | 1  |
| 2.8 | 0.9974 | 0.9975 | 0.9976 | 0.9977 | 0.9977 | 0.9978 | 0.9979 | 0.9979 | 0.9980 | 0.9981 | 0 | 0 | 0  | 0  | 0       | 0  | 0  | 1  | 1  |
| 2.9 | 0.9981 | 0.9982 | 0.9982 | 0.9983 | 0.9984 | 0.9984 | 0.9985 | 0.9985 | 0.9986 | 0.9986 | 0 | 0 | 0  | 0  | 0       | 0  | 0  | 0  | 0  |

## Critical values for the normal distribution

If Z has a normal distribution with mean 0 and variance 1 then, for each value of p, the table gives the value of z such that

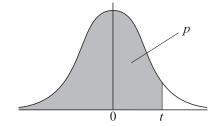
$$P(Z \leqslant z) = p.$$

| p | 0.75  | 0.90  | 0.95  | 0.975 | 0.99  | 0.995 | 0.9975 | 0.999 | 0.9995 |
|---|-------|-------|-------|-------|-------|-------|--------|-------|--------|
| Z | 0.674 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 2.807  | 3.090 | 3.291  |

# CRITICAL VALUES FOR THE t DISTRIBUTION

If T has a t distribution with v degrees of freedom then, for each pair of values of p and v, the table gives the value of t such that

$$P(T \le t) = p.$$

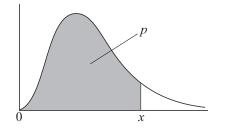


| p        | 0.75  | 0.90  | 0.95  | 0.975 | 0.99  | 0.995 | 0.9975 | 0.999 | 0.9995 |
|----------|-------|-------|-------|-------|-------|-------|--------|-------|--------|
| v = 1    | 1.000 | 3.078 | 6.314 | 12.71 | 31.82 | 63.66 | 127.3  | 318.3 | 636.6  |
| 2        | 0.816 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 14.09  | 22.33 | 31.60  |
| 3        | 0.765 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 7.453  | 10.21 | 12.92  |
| 4        | 0.741 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 5.598  | 7.173 | 8.610  |
| 5        | 0.727 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 4.773  | 5.894 | 6.869  |
| 6        | 0.718 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 4.317  | 5.208 | 5.959  |
| 7        | 0.711 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 4.029  | 4.785 | 5.408  |
| 8        | 0.706 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 3.833  | 4.501 | 5.041  |
| 9        | 0.703 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 3.690  | 4.297 | 4.781  |
| 10       | 0.700 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 3.581  | 4.144 | 4.587  |
| 11       | 0.697 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 3.497  | 4.025 | 4.437  |
| 12       | 0.695 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 3.428  | 3.930 | 4.318  |
| 13       | 0.694 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 3.372  | 3.852 | 4.221  |
| 14       | 0.692 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 3.326  | 3.787 | 4.140  |
| 15       | 0.691 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 3.286  | 3.733 | 4.073  |
| 16       | 0.690 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 3.252  | 3.686 | 4.015  |
| 17       | 0.689 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.222  | 3.646 | 3.965  |
| 18       | 0.688 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.197  | 3.610 | 3.922  |
| 19       | 0.688 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.174  | 3.579 | 3.883  |
| 20       | 0.687 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.153  | 3.552 | 3.850  |
| 21       | 0.686 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.135  | 3.527 | 3.819  |
| 22       | 0.686 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.119  | 3.505 | 3.792  |
| 23       | 0.685 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.104  | 3.485 | 3.768  |
| 24       | 0.685 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.091  | 3.467 | 3.745  |
| 25       | 0.684 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.078  | 3.450 | 3.725  |
| 26       | 0.684 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.067  | 3.435 | 3.707  |
| 27       | 0.684 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.057  | 3.421 | 3.689  |
| 28       | 0.683 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.047  | 3.408 | 3.674  |
| 29       | 0.683 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.038  | 3.396 | 3.660  |
| 30       | 0.683 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.030  | 3.385 | 3.646  |
| 40       | 0.681 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 2.971  | 3.307 | 3.551  |
| 60       | 0.679 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 2.915  | 3.232 | 3.460  |
| 120      | 0.677 | 1.289 | 1.658 | 1.980 | 2.358 | 2.617 | 2.860  | 3.160 | 3.373  |
| $\infty$ | 0.674 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 2.807  | 3.090 | 3.291  |

# CRITICAL VALUES FOR THE $\chi^2$ DISTRIBUTION

If X has a  $\chi^2$  distribution with v degrees of freedom then, for each pair of values of p and v, the table gives the value of x such that

$$P(X \le x) = p.$$



| p                 | 0.01   | 0.025  | 0.05                                     | 0.90                             | 0.95                             | 0.975                            | 0.99                             | 0.995                            | 0.999                            |
|-------------------|--|--|--|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| v = 1 $2$ $3$ $4$ | 0.0 <sup>3</sup> 1571<br>0.02010<br>0.1148<br>0.2971 | 0.0 <sup>3</sup> 9821<br>0.05064<br>0.2158<br>0.4844 | $0.0^{2}3932$ $0.1026$ $0.3518$ $0.7107$ | 2.706<br>4.605<br>6.251<br>7.779 | 3.841<br>5.991<br>7.815<br>9.488 | 5.024<br>7.378<br>9.348<br>11.14 | 6.635<br>9.210<br>11.34<br>13.28 | 7.879<br>10.60<br>12.84<br>14.86 | 10.83<br>13.82<br>16.27<br>18.47 |
| 5                 | 0.5543   | 0.8312   | 1.145                                    | 9.236                            | 11.07                            | 12.83                            | 15.09                            | 16.75                            | 20.51                            |
| 6                 | 0.8721   | 1.237  | 1.635                                    | 10.64                            | 12.59                            | 14.45                            | 16.81                            | 18.55                            | 22.46                            |
| 7                 | 1.239  | 1.690  | 2.167                                    | 12.02                            | 14.07                            | 16.01                            | 18.48                            | 20.28                            | 24.32                            |
| 8                 | 1.647  | 2.180  | 2.733                                    | 13.36                            | 15.51                            | 17.53                            | 20.09                            | 21.95                            | 26.12                            |
| 9                 | 2.088  | 2.700  | 3.325                                    | 14.68                            | 16.92                            | 19.02                            | 21.67                            | 23.59                            | 27.88                            |
| 10                | 2.558  | 3.247  | 3.940                                    | 15.99                            | 18.31                            | 20.48                            | 23.21                            | 25.19                            | 29.59                            |
| 11                | 3.053  | 3.816  | 4.575                                    | 17.28                            | 19.68                            | 21.92                            | 24.73                            | 26.76                            | 31.26                            |
| 12                | 3.571  | 4.404  | 5.226                                    | 18.55                            | 21.03                            | 23.34                            | 26.22                            | 28.30                            | 32.91                            |
| 13                | 4.107  | 5.009  | 5.892                                    | 19.81                            | 22.36                            | 24.74                            | 27.69                            | 29.82                            | 34.53                            |
| 14                | 4.660  | 5.629  | 6.571                                    | 21.06                            | 23.68                            | 26.12                            | 29.14                            | 31.32                            | 36.12                            |
| 15                | 5.229  | 6.262  | 7.261                                    | 22.31                            | 25.00                            | 27.49                            | 30.58                            | 32.80                            | 37.70                            |
| 16                | 5.812  | 6.908  | 7.962                                    | 23.54                            | 26.30                            | 28.85                            | 32.00                            | 34.27                            | 39.25                            |
| 17                | 6.408  | 7.564  | 8.672                                    | 24.77                            | 27.59                            | 30.19                            | 33.41                            | 35.72                            | 40.79                            |
| 18                | 7.015  | 8.231  | 9.390                                    | 25.99                            | 28.87                            | 31.53                            | 34.81                            | 37.16                            | 42.31                            |
| 19                | 7.633  | 8.907  | 10.12                                    | 27.20                            | 30.14                            | 32.85                            | 36.19                            | 38.58                            | 43.82                            |
| 20                | 8.260  | 9.591  | 10.85                                    | 28.41                            | 31.41                            | 34.17                            | 37.57                            | 40.00                            | 45.31                            |
| 21                | 8.897  | 10.28  | 11.59                                    | 29.62                            | 32.67                            | 35.48                            | 38.93                            | 41.40                            | 46.80                            |
| 22                | 9.542  | 10.98  | 12.34                                    | 30.81                            | 33.92                            | 36.78                            | 40.29                            | 42.80                            | 48.27                            |
| 23                | 10.20  | 11.69  | 13.09                                    | 32.01                            | 35.17                            | 38.08                            | 41.64                            | 44.18                            | 49.73                            |
| 24                | 10.86  | 12.40  | 13.85                                    | 33.20                            | 36.42                            | 39.36                            | 42.98                            | 45.56                            | 51.18                            |
| 25                | 11.52  | 13.12  | 14.61                                    | 34.38                            | 37.65                            | 40.65                            | 44.31                            | 46.93                            | 52.62                            |
| 30                | 14.95  | 16.79  | 18.49                                    | 40.26                            | 43.77                            | 46.98                            | 50.89                            | 53.67                            | 59.70                            |
| 40                | 22.16  | 24.43  | 26.51                                    | 51.81                            | 55.76                            | 59.34                            | 63.69                            | 66.77                            | 73.40                            |
| 50                | 29.71  | 32.36  | 34.76                                    | 63.17                            | 67.50                            | 71.42                            | 76.15                            | 79.49                            | 86.66                            |
| 60                | 37.48  | 40.48  | 43.19                                    | 74.40                            | 79.08                            | 83.30                            | 88.38                            | 91.95                            | 99.61                            |
| 70                | 45.44  | 48.76  | 51.74                                    | 85.53                            | 90.53                            | 95.02                            | 100.4                            | 104.2                            | 112.3                            |
| 80                | 53.54  | 57.15  | 60.39                                    | 96.58                            | 101.9                            | 106.6                            | 112.3                            | 116.3                            | 124.8                            |
| 90                | 61.75  | 65.65  | 69.13                                    | 107.6                            | 113.1                            | 118.1                            | 124.1                            | 128.3                            | 137.2                            |
| 100               | 70.06  | 74.22  | 77.93                                    | 118.5                            | 124.3                            | 129.6                            | 135.8                            | 140.2                            | 149.4                            |

# **WILCOXON SIGNED RANK TEST**

P is the sum of the ranks corresponding to the positive differences,

Q is the sum of the ranks corresponding to the negative differences,

T is the smaller of P and Q.

For each value of n the table gives the **largest** value of T which will lead to rejection of the null hypothesis at the level of significance indicated.

Critical values of T

|  |  | Level of si   | gnificance   | ;  |
|--|--|---|--|--|
| One Tail<br>Two Tail                         | 0.05<br>0.10   | 0.025<br>0.05   | 0.01<br>0.02   | 0.005<br>0.01  |
| n = 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | 2<br>3<br>5<br>8<br>10<br>13<br>17<br>21<br>25<br>30<br>35<br>41<br>47<br>53<br>60 | 0<br>2<br>3<br>5<br>8<br>10<br>13<br>17<br>21<br>25<br>29<br>34<br>40<br>46<br>52 | 0<br>1<br>3<br>5<br>7<br>9<br>12<br>15<br>19<br>23<br>27<br>32<br>37<br>43 | 0<br>1<br>3<br>5<br>7<br>9<br>12<br>15<br>19<br>23<br>27<br>32<br>37 |

For larger values of n, each of P and Q can be approximated by the normal distribution with mean  $\frac{1}{4}n(n+1)$  and variance  $\frac{1}{24}n(n+1)(2n+1)$ .

## **WILCOXON RANK SUM TEST**

The two samples have sizes m and n, where  $m \le n$ .

 $R_m$  is the sum of the ranks of the items in the sample of size m.

 $\overline{W}$  is the smaller of  $R_m$  and  $m(m+n+1)-R_m$ .

For each pair of values of m and n, the table gives the **largest** value of W which will lead to rejection of the null hypothesis at the level of significance indicated.

# Critical values of $\boldsymbol{W}$

|                                 | Level of significance      |                            |                                 |                                  |                                  |                                 |                            |                            |                            |                      |                      |                      |  |
|---------------------------------|----------------------------|----------------------------|---------------------------------|----------------------------------|----------------------------------|---------------------------------|----------------------------|----------------------------|----------------------------|----------------------|----------------------|----------------------|--|
| One Tail<br>Two Tail            | 0.05<br>0.1                | 0.025<br>0.05              | 0.01<br>0.02                    | 0.05<br>0.1                      | 0.025<br>0.05                    | 0.01<br>0.02                    | 0.05<br>0.1                | 0.025<br>0.05              | 0.01<br>0.02               | 0.05<br>0.1          | 0.025<br>0.05        | 0.01<br>0.02         |  |
| n                               | m = 3                      |                            |                                 | m = 4                            |                                  |                                 | m = 5                      |                            |                            | m = 6                |                      |                      |  |
| 3<br>4<br>5<br>6<br>7<br>8<br>9 | 6<br>6<br>7<br>8<br>8<br>9 | -<br>6<br>7<br>7<br>8<br>8 | -<br>-<br>-<br>-<br>6<br>6<br>7 | 11<br>12<br>13<br>14<br>15<br>16 | 10<br>11<br>12<br>13<br>14<br>14 | -<br>10<br>11<br>11<br>12<br>13 | 19<br>20<br>21<br>23<br>24 | 17<br>18<br>20<br>21<br>22 | 16<br>17<br>18<br>19<br>20 | 28<br>29<br>31<br>33 | 26<br>27<br>29<br>31 | 24<br>25<br>27<br>28 |  |

|                      | Level of significance |                      |                      |                |                |                |             |               |              |             |               |              |
|----------------------|-----------------------|----------------------|----------------------|----------------|----------------|----------------|-------------|---------------|--------------|-------------|---------------|--------------|
| One Tail<br>Two Tail | 0.05<br>0.1           | 0.025<br>0.05        | 0.01<br>0.02         | 0.05<br>0.1    | 0.025<br>0.05  | 0.01<br>0.02   | 0.05<br>0.1 | 0.025<br>0.05 | 0.01<br>0.02 | 0.05<br>0.1 | 0.025<br>0.05 | 0.01<br>0.02 |
| n                    | m = 7                 |                      |                      | m = 8          |                |                | m = 9       |               |              | m = 10      |               |              |
| 7<br>8<br>9<br>10    | 39<br>41<br>43<br>45  | 36<br>38<br>40<br>42 | 34<br>35<br>37<br>39 | 51<br>54<br>56 | 49<br>51<br>53 | 45<br>47<br>49 | 66<br>69    | 62<br>65      | 59<br>61     | 82          | 78            | 74           |

For larger values of m and n, the normal distribution with mean  $\frac{1}{2}m(m+n+1)$  and variance  $\frac{1}{12}mn(m+n+1)$  should be used as an approximation to the distribution of  $R_m$ .

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