CHCDF

PURPOSE

Compute the chi cumulative distribution function with degrees of freedom parameter v.

DESCRIPTION

The distribution of the positive square root of a variable having a chi-square distribution is a chi-distribution. The chi-distribution has the following probability density function:

$$f(x, \upsilon) = \frac{e^{\frac{-x^2}{2}} x^{\upsilon - 1}}{2^{\frac{\upsilon}{2} - 1} \Gamma\left(\frac{\upsilon}{2}\right)} \qquad x > 0, \upsilon > 0 \qquad \textbf{(EQ Aux-64)}$$

where Γ is the gamma function. The input value and the degrees of freedom should both be positive real numbers.

The cumulative distribution is the area under the curve from 0 to x (i.e., the integral of the above function). It has the formula:

$$F(x, \upsilon) = \frac{\Gamma_{\frac{x^2}{2}}\left(\frac{\upsilon}{2}\right)}{\Gamma\left(\frac{\upsilon}{2}\right)} \qquad x > 0, \upsilon > 0 \qquad \textbf{(EQ Aux-65)}$$

where Γ_a is the incomplete gamma function and Γ is the complete gamma function.

SYNTAX

LET <y2> = CHCDF(<y1>,<v>) <SUBSET/EXCEPT/FOR qualification>

where <y1> is a positive number, parameter, or variable;

<y2> is a variable or a parameter (depending on what <y1> is) where the computed chi cdf value is stored;

<v> is a positive number, parameter, or variable that specifies the degrees of freedom;

and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

LET A = CHCDF(3,10)
LET A = CHCDF(A1,10)
LET X2 = CHCDF(X1,10)

NOTE

The chi-distribution includes several distributions as special cases. If v is 1, the chi-distribution reduces to the half-normal distribution. If v is 2, the chi-distribution is a Rayleigh distribution. If v is 3, the chi-distribution is a Maxwell-Boltzmann distribution. A generalized Rayleigh distribution is a chi-distribution with a scale parameter equal to 1.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

CHPDF	=	Compute the chi probability density function.
CHPPF	=	Compute the chi percent point function.
CHSCDF	=	Compute the chi-square cumulative distribution function.
CHSPDF	=	Compute the chi-square probability density function.
CHSPPF	=	Compute the chi-square percent point function.
WEICDF	=	Compute the Weibull cumulative distribution function.
WEIPDF	=	Compute the Weibull probability density function.
WEIPPF	=	Compute the Weibull percent point function.
NORCDF	=	Compute the normal cumulative distribution function.

NORPDF	=	Compute the normal probability density function.
NORPPF	=	Compute the normal percent point function.

REFERENCE

"Continuous Univariate Distributions," Johnson, Kotz, and Balakrishnan, John Wiley and Sons, 1994, (chapter 18).

"Statistical Distributions," 2nd ed., Evans, Hastings, and Peacock, John Wiley and Sons, 1993, (chapters 8 and 34).

APPLICATIONS

Reliability

IMPLEMENTATION DATE

95/4

PROGRAM

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LET STRING S1 = HALF-NORMAL DISTRIBUTION
LET STRING S2 = RAYLEIGH DISTRIBUTION
LET STRING S3 = MAXWELL-BOTZMAN DISTRIBUTION
LET STRING S4 = V=4
LET STRING S5 = V=5
LET STRING S6 = V=6
LET STRING S7 = V=7
LET STRING S8 = V=8
LET STRING S9 = V=9
MULTIPLOT 3 3; MULTIPLOT CORNER COORDINATES 0 0 100 100
TITLE AUTOMATIC
LOOP FOR K = 1 1 9
    X1LABEL ^S^K
    PLOT CHCDF(X,K) FOR X = 0.01 0.01 5
END OF LOOP
END OF MULTIPLOT
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