

**GGDPDF****PURPOSE**

Compute the standard form of the generalized gamma probability density function.

**DESCRIPTION**

The standard form of the generalized gamma distribution has the following probability density function:

$$f(x, k, c) = \frac{cx^{ck-1}e^{-x^c}}{\Gamma(k)} \quad x > 0, k > 0, c \neq 0 \quad \text{(EQ Aux-172)}$$

where k and c are shape parameters and  $\Gamma$  is the complete gamma function.

**SYNTAX**

LET <y2> = GGDPDF(<y1>,<k>,<c>) <SUBSET/EXCEPT/FOR qualification>

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

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

<k> is a positive number, parameter, or variable that specifies the first shape parameter;

<c> is a non-zero number, parameter, or variable that specifies the second shape parameter;

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

**EXAMPLES**

LET A = GGDCDF(3,1.5,0.6)

LET X2 = GGDCDF(X1,GAMMA,POWER)

**NOTE 1**

If c is 1, this distribution reduces to the standard gamma distribution. If k is 1, this distribution reduces to a Weibull distribution. If k = 1/2 and c = 2, it reduces to a half-normal distribution. Several other common distributions are special cases of the generalized gamma distribution.

The second shape parameter can be negative (but not zero). Specifically, if c = -1, the generalized gamma is the inverted gamma distribution.

**NOTE 2**

The general form of the generalized gamma distribution is:

$$f(x, k, c, a, b) = \frac{c(x-a)^{ck-1}e^{-\left(\frac{x-a}{b}\right)^c}}{b^ck\Gamma(k)} \quad x > a, k > 0, c \neq 0, a > 0, b > 0 \quad \text{(EQ Aux-173)}$$

The parameter a is a location parameter and the parameter b is a scale parameter. See topic (3) under the General considerations section at the beginning of this chapter for a discussion of generating pdf values for the general form of the distribution.

**DEFAULT**

None

**SYNONYMS**

None

**RELATED COMMANDS**

GGDCDF	=	Compute the generalized gamma cumulative distribution function.
GGDPPF	=	Compute the generalized gamma percent point function.
GAMCDF	=	Compute the gamma cumulative distribution function.
GAMPDF	=	Compute the gamma probability density function.
GAMPPF	=	Compute the gamma percent point function.
WEICDF	=	Compute the Weibull cumulative distribution function.
WEIPDF	=	Compute the Weibull probability density function.
WEIPPF	=	Compute the Weibull 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.

REFERENCE

“Continuous Univariate Distributions,” 2nd. ed., Johnson, Kotz, and Balakrishnan, John Wiley and Sons, 1994 (chapter 17).  
 “Statistical Distributions,” 2nd. Edition, Evans, Hastings, and Peacock, Wiley and Sons, 1993 (chapter 18).

APPLICATIONS

Reliability

IMPLEMENTATION DATE

95/5

PROGRAM

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LET G = DATA 1 1 1 0.5 0.5 0.5 2 2 2
LET C = DATA 0.5 1 2 0.5 1 2 0.5 1 2
LET START = DATA 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
LET INC = DATA 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
LET STOP = DATA 5 5 5 5 5 5 5 5 5

MULTIPLY 3 3; MULTIPLY CORNER COORDINATES 0 0 100 100
TITLE AUTOMATIC
LOOP FOR K = 1 1 9
    LET G1 = G(K); LET C1 = C(K)
    LET FIRST = START(K); LET LAST = STOP(K)
    LET INCT = INC(K)
    X1LABEL GAMMA = ^G1; X2LABEL C = ^C1
    PLOT GGDPDF(X,G1,C1) FOR X = FIRST INCT LAST
END OF LOOP
END OF MULTIPLY
    
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