PLNCDF

PURPOSE
Compute the standard lognormal cumulative distribution function.

DESCRIPTION
The standard lognormal distribution has the following probability density function:

$$f(x, \sigma, p) = \left(\frac{p}{x\sigma}\right)\phi\left(\frac{\ln(x)}{\sigma}\right)\left(\Phi\left(\frac{-\ln(x)}{\sigma}\right)\right)^{p-1} \qquad x > 0, \sigma > 0, p > 0 \qquad \textbf{(EQ Aux-260)}$$

where σ is the shape parameter, p is the power parameter, and Φ and ϕ are the cumulative distribution function and the probability density function for the standard normal distribution respectively. 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:

$$F(x, \sigma, p) = 1 - \left(\Phi\left(\frac{-\ln(x)}{\sigma}\right)\right)^{p} \qquad x > 0, \sigma > 0, p > 0 \qquad \textbf{(EQ Aux-261)}$$

If p is 1, this distribution reduces to the lognormal distribution.

SYNTAX
LET <y2> = PLNCDF(<y1>,<p>,<s>)   <SUBSET/EXCEPT/FOR qualification>
where <y1> is a non-negative number, parameter, or variable;

    <p> is a positive number, parameter, or variable that specifies the power parameter;

    <s> is an optional positive number, parameter, or variable that specifies the shape parameter;

    <y2> is a variable or a parameter (depending on what <y1> is) where the computed lognormal pdf value is stored;
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

If the <s> parameter is omitted, it defaults to 1.

EXAMPLES
LET A = PLNCDF(3,2,1)
LET X2 = PLNCDF(X1,POW,SD)
LET X2 = PLNCDF(X1,1,0.5)

NOTE
The general power-lognormal distribution has the following probability density function:

$$f(x, \mu, \sigma, p) = \left(\frac{p}{x\sigma}\right)\phi\left(\frac{\ln(x)-\mu}{\sigma}\right)\left(\Phi\left(\frac{-\ln(x)-\mu}{\sigma}\right)\right)^{p-1} \qquad x > 0, \sigma > 0, p > 0 \qquad \textbf{(EQ Aux-262)}$$

where μ is the location parameter, σ is the shape parameter and p is the power parameter. The cumulative distribution function has the formula:

$$F(x, \mu, \sigma, p) = 1 - \left(\Phi\left(\frac{-\ln(x)-\mu}{\sigma}\right)\right)^{p} \qquad x > 0, \sigma > 0, p > 0 \qquad \textbf{(EQ Aux-263)}$$

DEFAULT
None

SYNONYMS
None

RELATED COMMANDS
PLNPDF	=	Compute the power-lognormal probability density function.
PLNPPF	=	Compute the power-lognormal percent point function.
PNRCDF	=	Compute the power-normal cumulative density function.
PNRPDF	=	Compute the power-normal probability density function.
PNRPPF	=	Compute the power-normal percent point function.
LGNCDF	=	Compute the lognormal cumulative distribution function.

| LGNPDF | = | Compute the lognormal probability density function. |
| LGNPPF | = | Compute the lognormal percent point function. |

REFERENCE

"A Computer Program POWNOR for Fitting the Power-Normal and -Lognormal Models to Life or Strength Data from Specimens of Various Sizes," Nelson and Doganaksoy, NIST-IR 4760, March 1992.

APPLICATIONS

Reliability

IMPLEMENTATION DATE

95/5

PROGRAM

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TITLE SD=1, P=10000, 3000, 1000, 300, 100, 50, 20, 5, 1, 0.5, 0.2 0.1
TITLE SIZE 2; X1LABEL CDF's
YLIMITS 0 1; YTIC OFFSET 0 0.1
MAJOR YTIC MARK NUMBER 6
.
PLOT PLNCDF(X,10000,1) FOR X = 0.01 .05 3 AND
PLOT PLNCDF(X,3000,1) FOR X = 0.01 .05 3 AND
PLOT PLNCDF(X,1000,1) FOR X = 0.01 .05 3 AND
PLOT PLNCDF(X,300,1) FOR X = 0.01 .05 3 AND
PLOT PLNCDF(X,100,1) FOR X = 0.01 .05 3 AND
PLOT PLNCDF(X,50,1) FOR X = 0.01 .05 3 AND
PLOT PLNCDF(X,20,1) FOR X = 0.01 .05 3 AND
PLOT PLNCDF(X,5,1) FOR X = 0.01 .05 3 AND
PLOT PLNCDF(X,1,1) FOR X = 0.01 .05 3 AND
PLOT PLNCDF(X,0.5,1) FOR X = 0.01 .05 3 AND
PLOT PLNCDF(X,0.2,1) FOR X = 0.01 .05 3 AND
PLOT PLNCDF(X,0.1,1) FOR X = 0.01 .05 3
```