# CHPDF

## PURPOSE
Compute the chi probability density 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:

$$f(x, \upsilon) = \frac{e^{\frac{-x^2}{2}} x^{\upsilon - 1}}{2^{\frac{\upsilon}{2} - 1} \Gamma\left(\frac{\upsilon}{2}\right)} \qquad x > 0, \upsilon > 0 \qquad \text{(EQ Aux-66)}$$

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

## SYNTAX
LET \<y2\> = CHPDF(\<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 pdf 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 = CHPDF(3,10)
LET A = CHPDF(A1,10)
LET X2 = CHPDF(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. The generalized Rayleigh distribution is a chi-distribution with a scale parameter equal to 1.

## DEFAULT
None

## SYNONYMS
None

## RELATED COMMANDS
| | | |
|---|---|---|
| CHCDF | = | Compute the chi cumulative distribution 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
>    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 CHPDF(X,K) FOR X = 0.01 0.01 5
>    END OF LOOP
>    END OF MULTIPLOT