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Submitter :
Language : Fortran

Library: MATHLIB
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Gamma Distribution

Function subprogram `GAMDIS` calculates the gamma distribution function (incomplete gamma function)

$$P(x,a) \;=\; \frac{1}{\Gamma(a)} \int_0^x e^{-t}\, t^{a-1}\, dt$$

for real arguments $x \geq 0$ and $a > 0$.

Structure:

`FUNCTION` subprogram
User Entry Name: `GAMDIS`
Files Referenced: `Unit 6`
External References: `GAMMA` (C302), `ALGAMA` (C304), `MTLMTR` (N002), `ABEND` (Z035)

Usage:

In any arithmetic expression,

`GAMDIS(X,A)` has the value $P(\mathtt{X},\mathtt{A})$,

where `GAMDIS`, `X` and `A` are of type `REAL`.

Method:

The method is described in Ref. 1.

Accuracy:

Approximately six digits are correct.

Error handling:

Error `G106.1`: $\mathtt{X} < 0$ or $\mathtt{A} \leq 0$.
Error `G106.2`: Difficulties of convergence (unlikely).
The function value is set equal to zero, and a message is written on `Unit 6`, unless subroutine `MTLSET` (N002) has been called.

Notes:

1. For greater accuracy, or for the case $a \leq 0$, use `GAPNC` (C334). Note, however, that in this case the arguments `X` and `A` must be interchanged.
2. Note that, for integer $\mathtt{N} \geq 1$, $\mathtt{GAMDIS(X,N/2.)} = 1 - \mathtt{PROB}(2*\mathtt{X},\mathtt{N})$, where `PROB` (G100) is the upper tail probability of the chi-squared distribution function. `PROB` (G100) is faster than `GAMDIS` (G106) in this case.

Source:

This subprogram is based on a Fortran program for the incomplete gamma functions published in Ref. 2.

References:

1. W. Gautschi, A computational procedure for incomplete gamma functions, ACM Trans. Math. Software **5** (1979) 466–481.
2. W. Gautschi,Algorithm 542, Incomplete gamma functions, Collected Algorithms from CACM (1979).

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