Author(s) : K.S. Kölbig
Library: MATHLIB or Fortran Computer Library
Submitter :
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Gamma Function for Positive Argument

Function subprograms `GAMMA`, `DGAMMA` and `QGAMMA` calculate the gamma function

$$\Gamma(x) = \int_0^\infty e^{-t} t^{x-1} dt \qquad (x > 0)$$

for real argument $x > 0$.
The quadruple-precision version `QGAMMA` is available only on computers which support a `REAL*16` Fortran data type.

Structure:

`FUNCTION` subprograms
User Entry Names: `GAMMA`, `DGAMMA`, `QGAMMA`
Files Referenced: `Unit 6`
External References: `MTLMTR` (N002), `ABEND` (Z035)

Usage:

In any arithmetic expression,

`GAMMA(X)`, `DGAMMA(X)` or `QGAMMA(X)` has the value $\Gamma(X)$,

where `GAMMA` is of type `REAL`, `DGAMMA` is of type `DOUBLE PRECISION`, `QGAMMA` is of type `REAL*16`, and `X` has the same type as the function name.

Method:

Approximation by truncated Chebyshev series and functional relations.

Accuracy:

The system-supplied version (see **Notes**) has full machine accuracy. The CERN version of `GAMMA` (except on CDC and Cray computers) has full single-precision accuracy. The CERN version of `DGAMMA`, `QGAMMA` (and of `GAMMA`, `DGAMMA` on CDC and Cray computers) have an accuracy which is approximately one digit less than machine precision.

Error handling:

Error `C302.1`: `X` $\leq$ `0`. The function value is set equal to zero, and a message is written on `Unit 6` unless subroutine `MTLSET` (N002) has been called.

Notes:

If the function `GAMMA` or `DGAMMA` is available in the system-supplied Fortran mathematical library, the system-supplied function will be loaded instead of the CERN version.

References:

1. Y.L. Luke, Mathematical functions and their approximations, (Academic Press, New York 1975) 4.

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