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Submitter :
Language : Fortran

Library: MATHLIB or Fortran Compiler Library
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Logarithm of the Gamma Function

Function subprograms `ALGAMA`, `DLGAMA` and `QLGAMA` compute the logarithm of the gamma function

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

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

Structure:

`FUNCTION` subprograms
User Entry Names: `ALGAMA`, `DLGAMA`, `QLGAMA`
Obsolete User Entry Names: `ALOGAM` ≡ `ALGAMA`, `DLOGAM` ≡ `DLGAMA`
Files Referenced: `Unit 6`
External References: `MTLMTR` (N002), `ABEND` (Z035)

Usage:

In any arithmetic expression,

`ALGAMA(X)`, `DLGAMA` or `QLGAMA(X)` has the value $\ln\Gamma(X)$,

where `ALGAMA` is of type `REAL`, `DLGAMA` is of type `DOUBLE PRECISION`, `QLGAMA` is of type `REAL*16`, and `X` has the same type as the function name.

Method:

Rational approximations.

Accuracy:

The system-supplied version (see **Notes**) has full machine accuracy. The CERN-supplied version of `ALGAMA` (except on CDC and Cray computers) has full single-precision accuracy. For most values of the argument `X`, the CERN-supplied versions of `DLGAMA`, `QLGAMA` (and of `ALGAMA`, `DLGAMA` on CDC and Cray computers) have an accuracy of approximately one significant digit less than the machine precision.

Error handling:

Error `C304.1: X` $\leq$ `0`. The function value is set equal to zero, and a message is written on on `Unit 6`, unless subroutine `MTLSET` (N002) has been called.

Notes:

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

References:

1. W.J. Cody and K.E. Hillstrom, Chebyshev approximations for the natural logarithm of the gamma function, Math. Comp. **21** (1967) 198–203.
2. J.F. Hart et al., Computer approximations (John Wiley Sons, New York 1968) 287.

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