Author(s) : K.S. Kölbig
Submitter :
Language : Fortran

Library: MATHLIB
Submitted: 07.12.1970
Revised: 15.03.1993

Complex Error Function

Function subprograms `CWERF` and `WWERF` calculate the complex error function

$$w(z) \;=\; e^{-z^2}\left[1+\frac{2i}{\sqrt{\pi}}\int_0^z e^{t^2}\,dt\right] \;=\; e^{-z^2}\left[1-\mathrm{erf}\,(-iz)\right] \;=\; e^{-z^2}\,\mathrm{erfc}\,(-iz)$$

for complex arguments z, where $i=\sqrt{-1}$.
The double-precision version `WWERF` is available only on computers which support a `COMPLEX*16` Fortran data type.

Structure:

`FUNCTION` subprograms
User Entry Names: `CWERF`, `WWERF`

Usage:

In any arithmetic expression,

`CWERF(Z)` or `WWERF(Z)` has the value $w(\mathrm{Z})$,

where `CWERF` is of type `COMPLEX`, `WWERF` is of type `COMPLEX*16`, and `Z` has the same type as the function name.

Method:

The method is described in Ref. 2.

Accuracy:

`CWERF` (except on CDC and Cray computers) has full single-precision accuracy. For most values of the argument `Z`, `WWERF` (and `CWERF` on CDC and Cray computers) has an accuracy of approximately two significant digits less than the machine precision.

Notes:

This subprogram is a modified version of the algorithm presented in Ref. 1.

References:

1. W. Gautschi, Algorithm 363, Complex Error Function, Collected Algorithms from CACM (1969).
2. W. Gautschi, Efficient Computation of the Complex Error Function, SIAM J. Numer. Anal. **7** (1970) 187–198.
3. K.S. Kölbig, Certification of Algorithm 363 Complex Error Function, Comm. ACM **15** (1972) 465–466.

•