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Ultra-high precision computations. (English) [Zbl 0792.65010]

Summary: We describe a machine independent Fortran subroutine which performs the four basic arithmetic operations with a degree of accuracy prescribed by the user. Tables of Chebyshev expansions of orders 48 and 50 for some basic mathematical functions are obtained as a result of applying this subroutine in conjunction with the recursive formulation of the tau method. A recently devised technique for the sharp determination of upper and lower error bounds for tau method approximations enables us to find the degree $n$ required to achieve a prescribed accuracy $\varepsilon$ over a given interval $[a, b]$. A number of practical illustrations are given.

MSC:

65D20 Computation of special functions and constants, construction of tables
65A05 Tables in numerical analysis
26-04 Software, source code, etc. for problems pertaining to real functions
26A09 Elementary functions

Keywords:
ultra-high precision computations; tables; Fortran subroutine; Chebyshev expansions; basic mathematical functions; tau method; error bounds

Software:
Algorithm 524; ALGOL 68; Cephes

Full Text: DOI

References:

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