Wilkinson's Polynomial

`wilkinson.1.n`

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Ring: $\mathbb{R}[x]$
Equations:

$$\prod_{i=1}^{n}(x-i), \quad (n=20).$$

Polynomial supplied by Wilkinson. Added to the list by D. A. Bini (Oct. 1996).

1 Characteristics

- Coefficients are very large integers and the roots are very ill-conditioned already for $n = 20$.
- The condition number of the roots, for $n = 20$ ranges from 420 to 10^{14}.

2 Problem

Newton-isolate all the roots.

2.1 Solution

Algorithm based on simultaneous iterations (Aberth's method) with cluster analysis (see [**?**]).

Program in Fortran 90 based on the multiprecision package MPFUN, by D. Bailey.

Machine used: IBM Risc 6000.

Time for Newton-isolating all the roots for $n = 20$: 2.94 seconds; for $n = 40$: 40 seconds.

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References

[1] D. Bini. Numerical computation of polynomial zeros by means of aberth's method. *Numerical Algorithms*, 1997. (to appear).

[2] D. Bini and B. Mourrain. Polynomials test suite. 1996.