Polynomial with large and small clustered roots.

`lgsmclust.1.n`

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

$(x^{12} - (10^{20}x - 1)^4)(1 + (10^{20} + x)^4 x^8)$

Polynomial supplied by D. A. Bini (Oct. 1996).

1 Characteristics

- The polynomial has 4 roots of modulus 10^{-20} matching in the first 60 digits, and 4 zeros of modulus 10^{20} matching in the first 60 digits.

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: 9.75 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.