1 SUMMARY

To find all the roots of a quartic polynomial, i.e. the zeros of

\[ a_0 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4 = 0 \]

The method is non-iterative, see, Maths. of Computation, 279-281, July 1960.

ATTRIBUTES — Version: 1.0.0. Remark: An iterative method is likely to produce more accurate results, try PA07AD. Types: PA05A; PA05AD. Calls: PA03. Original date: January 1963. Origin: S.Marlow, Harwell.

2 HOW TO USE THE PACKAGE

2.1 Argument list

The single precision version

CALL PA05A(A,R,N)

The double precision version

CALL PA05AD(A,R,N)

**A** is a REAL (DOUBLE PRECISION in the D version) array which must be set by the user to the five coefficients of the polynomial, i.e. set \( A(j+1) = a_j \), \( j=0, 1, 2, 3, 4 \).

**R** is a REAL (DOUBLE PRECISION in the D version) array of length at least 4 which will be returned containing the roots found by the subroutine. The manner in which the roots are returned varies depending on the number of real roots (returned in \( N \)).

\( N=4 \) the four real roots are returned in the order \( R(1) \leq R(2) \leq R(3) \leq R(4) \).

\( N=2 \) the two real roots are returned in \( R(1) \leq R(2) \) and the real part of the complex pair will be in \( R(3) \) and the imaginary part will be in \( R(4) \). Note that \( R(4) \) is always positive.

\( N=0 \) the real parts of the two complex pairs will be returned in \( R(1) \) and \( R(3) \), and the corresponding imaginary parts will be in \( R(2) \) and \( R(4) \). Note that both \( R(2) \) and \( R(4) \) are always positive.

**N** is an INTEGER variable which is set by the subroutine to the number of real roots.

3 GENERAL INFORMATION

Workspace: None.

Use of common: None.

Other routines called directly: PA03A/AD.

Input/output: None.

Restrictions: None.

4 METHOD

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