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)` ≤ `R(2)` ≤ `R(3)` ≤ `R(4)`.
- `N=2` the two real roots are returned in `R(1)` ≤ `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

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