1 SUMMARY

To find the **first m terms of the Taylor series expansion of** $B(x)=1/A(x)$**,** i.e. such that $A(x)B(x)\equiv 1$. Let

$$A(x)=a_1+a_2x+a_3x^2+...+a_{n+1}x^n,$$

where the first k coefficients a_i, i=1, 2,..., k can be zero with $a_{k+1}\neq 0$, then the Taylor series expansion

$$B(x)=x^{-k}(b_1+b_2x+b_3x^2+...+b_mx^{m-1}+...)$$

is obtained by considering identities between $A(x)$ and $B(x)$.

ATTRIBUTES — **Version:** 1.0.0. **Types:** `PD02A; PD02AD.` **Original date:** December 1970. **Origin:** M.J.Hopper, Harwell.

2 HOW TO USE THE PACKAGE

2.1 Argument list

The single precision version

```
CALL PD02A(A,N,B,M,K)
```

The double precision version

```
CALL PD02AD(A,N,B,M,K)
```

`A` is a `REAL` (`DOUBLE PRECISION` in the D version) array which must be set by the user to the coefficients of the polynomial $A(x)$, so that `A(j)` = a_j, j=1, 2,..., n+1. If the first k elements `A(J), J=1,K` are zero the subroutine will detect this and return the value of k (see argument `K`).

`N` is an `INTEGER` variable which must be set by the user to n the degree of the polynomial $A(x)$.

`B` is a `REAL` (`DOUBLE PRECISION` in the D version) array of length at least m in which the subroutine will return the first m terms of the expansion $B(x)$, i.e., `B(j)` = b_j, j=1, 2,..., m.

`M` is an `INTEGER` variable which must be set by the user to m the number of terms required from the expansion $B(x)$.

`K` is an `INTEGER` variable which is set by the subroutine to k the number of leading coefficients of $A(x)$ found to be zero.

3 GENERAL INFORMATION

Workspace: none.

Use of common: none.

Input/output: none.

Restrictions: $n\geq 0$, $m\geq 0$.

4 METHOD

Assume $A(x)B(x) = 1$, then equating coefficients of like powers of x the recurrence relation

$$b_1 = 1/a_1,$$

$$b_i = \frac{-1}{a_1}\left[a_2 b_{i-1} + ... + a_{i-1} b_2 + a_i b_1\right],$$

for i = 1, 2,..., m is obtained.