1 SUMMARY

Calculates the coefficients of the piece-wise cubic function which interpolates \( n \) given function values \( f_i \) at points \( x_i, i=1, 2, ..., n \).

The interpolation function derived will be continuous and have continuous first derivatives. If the function values lie on a quadratic polynomial, this will be represented exactly. The subroutine returns the coefficients of the \( n-1 \) cubics \( C_i(\theta) \) corresponding to the \( n-1 \) intervals \( x_i \) to \( x_{i+1} \) in the transformed variables

\[
\theta = \frac{x-x_i}{x_{i+1}-x_i}, \quad \text{i.e.} \quad C_i(\theta) = a_1 + a_2 \theta + a_3 \theta^2 + a_4 \theta^3 \quad 0 \leq \theta \leq 1
\]


2 HOW TO USE THE PACKAGE

2.1 Argument list

The single precision version

\[
\text{CALL TB03A}(N,F,X,A)
\]

The double precision version

\[
\text{CALL TB03AD}(N,F,X,A)
\]

\( N \) is an INTEGER variable which must be set by the user to \( n \), the number of function values passed in the array \( F \). \( N \) is not altered by the subroutine. **Restriction**: \( n \geq 4 \).

\( F \) is a REAL (DOUBLE PRECISION in the D version) array which must be set by the user to contain the function values \( f_i, i=1, 2, ..., n \). \( F \) is not altered by the subroutine.

\( X \) is a REAL (DOUBLE PRECISION in the D version) array which must be set by the user to contain the values of the points \( x_i, i=1, 2, ..., n \). \( X \) is not altered by the subroutine. **Restriction**: the points must be ordered and distinct, i.e. \( x_1 \prec x_2 \prec ... \prec x_n \).

\( A \) is a two-dimensional REAL (DOUBLE PRECISION in the D version) array of first dimension 4 and second dimension at least \( n-1 \), which is set by the subroutine to the coefficients of the cubics for the \( n-1 \) intervals. In the interval \( x_i \) to \( x_{i+1} \) the function is represented by the cubic

\[
C_i(\theta) = a_{i_j} + a_{i_2} \theta + a_{i_3} \theta^2 + a_{i_4} \theta^3
\]

which is a good approximation to \( f((1-\theta)x_i + \theta x_{i+1}) \). The values of \( a_{i_j}, j=1, 2, 3, 4 \) and \( i=1, 2, ..., n-1 \) are returned in \( A(J, I) , J=1, 4 \) and \( I=1, N-1 \).

Note that the values of \( f_i \) and \( f_{i+1} \) are given by substituting \( \theta=0 \) and \( \theta=1 \) respectively, and values for \( x \) between \( x_i \) and \( x_{i+1} \) are given by values of \( \theta \) between 0 and 1.
3 GENERAL INFORMATION

Use of common: None.
Workspace: None.
Other routines called directly: None.
Input/output: None.
Restrictions: None.