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An integral of type $\mathrm{R}(\mathrm{x}, \sqrt{\mathrm{a}+\mathrm{bx}+\mathrm{cx}^2})$

Subroutine subprograms `RSRTNT` and `DSRTNT` calculate, based on indefinite integration, the definite integral

$$I(k,n;a,b,c;u,v) \quad = \quad \int_u^v \frac{x^k\,dx}{(\sqrt{a+bx+cx^2})^n},$$

for $k=-3,-2,-1,0,1,2,3$ and $n=1,3$, provided that $a+bx+cx^2>0$ for $u<x<v$ and the limits u,v are such that the integral converges. In particular, the Cauchy principal value is taken if $k=-1$ and $uv<0$.

On CDC and Cray computers, the double-precision version `DSRTNT` is not provided.

Structure:

`SUBROUTINE` subprograms
User Entry Names : `RSRTNT`, `DSRTNT`
Files Referenced : `Unit 6`
External References: `MTLMTR` (N002), `ABEND` (Z035)

Usage:

For `t` = `R` (type `REAL`), `t` = `D` (type `DOUBLE PRECISION`),

```
CALL tSRTNT(K,N,A,B,C,U,V,RES,LRL)
```

`K` (`INTEGER`) Power k of x.

`N` (`INTEGER`) Power n of $\sqrt{a+bx+cx^2}$.

`A,B,C` (type according to `t`) Coefficients a, b, c.

`U,V` (type according to `t`) Limits of integration u, v.

`RES` (type according to `t`) Contains, on exit, the value I provided `LRL` = `.TRUE.`, the value zero otherwise.

`LRL` (`LOGICAL`) Contains, on exit, the value `.TRUE.` if the integral exists in the sense described above, the value `.FALSE.` otherwise.

Restrictions:

1. $|\mathtt{A}|+|\mathtt{B}|+|\mathtt{C}| \neq 0$.   2. $|\mathtt{K}| \le 3$; `N` = 1 or `N` = 3.

Error handling:

Error `B300.1`: Restriction 1 is not satisfied. Error `B300.2`: Restriction 2 is not satisfied.
In both cases, `RES` is set equal to zero and `LRL` is set equal to `.FALSE.`, and a message is written on `Unit 6`, unless subroutine `MTLSET` (N002) has been called.

References:

1. I.S. Gradshteyn and I.M. Ryzhik, Table of integrals, series, and products, (Academic Press, New York 1980) Sect. 2.26

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