

NAG Library Routine Document

F06AAF (DROTG)

Note: before using this routine, please read the Users' Note for your implementation to check the interpretation of ***bold italicised*** terms and other implementation-dependent details.

1 Purpose

F06AAF (DROTG) generates a real Givens plane rotation.

2 Specification

SUBROUTINE F06AAF (A, B, C, S)

REAL (KIND=nag_wp) A, B, C, S

The routine may be called by its BLAS name ***drotg***.

3 Description

F06AAF (DROTG) generates a real Givens plane rotation with parameters c and s , such that, given real a and b :

$$\begin{pmatrix} c & s \\ -s & c \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} d \\ 0 \end{pmatrix}.$$

The routine computes c , s and d as follows:

$$d = \sigma \sqrt{a^2 + b^2};$$

$$c = \begin{cases} a/d, & \text{if } d \neq 0, \\ 1, & \text{if } d = 0, \end{cases} \quad s = \begin{cases} b/d, & \text{if } d \neq 0, \\ 0, & \text{if } d = 0, \end{cases}$$

$$\text{where } \sigma = \begin{cases} \text{sign } a, & \text{if } |a| > |b|, \\ \text{sign } b, & \text{if } |a| \leq |b|. \end{cases}$$

The routine also computes the value z defined as

$$z = \begin{cases} s, & \text{if } |s| < c \text{ or } c = 0, \\ 1/c, & \text{if } 0 < |c| \leq s. \end{cases}$$

This enables c and s to be reconstructed from the single value z as

$$c = \begin{cases} \sqrt{1 - z^2}, & \text{if } |z| \leq 1, \\ 1/z, & \text{if } |z| > 1, \end{cases} \quad s = \begin{cases} z, & \text{if } |z| \leq 1, \\ \sqrt{1 - c^2}, & \text{if } |z| > 1. \end{cases}$$

To apply the plane rotation to a pair of real vectors, call F06EPF (DROT); to apply it to a pair of complex vectors, call F06KPF (ZDROT).

4 References

None.

5 Arguments

1: A – REAL (KIND=nag_wp)

Input/Output

On entry: the value a , the first element of the vector which determines the rotation.

On exit: the value d .

- 2: B – REAL (KIND=nag_wp) *Input/Output*
On entry: the value b , the second element of the vector which determines the rotation.
On exit: the value z , from which c and s can be reconstructed.
- 3: C – REAL (KIND=nag_wp) *Output*
On exit: the value c , the cosine of the rotation.
- 4: S – REAL (KIND=nag_wp) *Output*
On exit: the value s , the sine of the rotation.

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Parallelism and Performance

F06AAF (DROTG) is not threaded in any implementation.

9 Further Comments

None.

10 Example

None.
