

NAG Library Routine Document

A02ABF

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

A02ABF returns the value of the modulus of the complex number $x = (x_r, x_i)$.

2 Specification

```
FUNCTION A02ABF (XR, XI)
REAL (KIND=nag_wp) A02ABF
REAL (KIND=nag_wp) XR, XI
```

3 Description

The function evaluates $\sqrt{x_r^2 + x_i^2}$ by using $a\sqrt{1 + (\frac{b}{a})^2}$ where a is the larger of $|x_r|$ and $|x_i|$, and b is the smaller of $|x_r|$ and $|x_i|$. This ensures against unnecessary overflow and loss of accuracy when calculating $(x_r^2 + x_i^2)$.

4 References

Wilkinson J H and Reinsch C (1971) *Handbook for Automatic Computation II, Linear Algebra* Springer-Verlag

5 Arguments

1: XR – REAL (KIND=nag_wp) *Input*
2: XI – REAL (KIND=nag_wp) *Input*

On entry: x_r and x_i , the real and imaginary parts of x , respectively.

6 Error Indicators and Warnings

None.

7 Accuracy

The result should be correct to *machine precision*.

8 Parallelism and Performance

A02ABF is not threaded in any implementation.

9 Further Comments

None.

10 Example

This example finds the modulus of $-1.7 + 2.6i$.

10.1 Program Text

```

Program a02abfe

!      A02ABF Example Program Text
!
!      Mark 26 Release. NAG Copyright 2016.
!
!      .. Use Statements ..
!      Use nag_library, Only: a02abf, nag_wp
!      .. Implicit None Statement ..
!      Implicit None
!      .. Parameters ..
!      Integer, Parameter          :: nin = 5, nout = 6
!      .. Local Scalars ..
!      Real (Kind=nag_wp)         :: xi, xr, y
!      .. Executable Statements ..
!      Write (nout,*) 'A02ABF Example Program Results'

!      Skip heading in data file
!      Read (nin,*)

!      Read (nin,*) xr, xi

!      Return absolute value of (XR,XI)

!      y = a02abf(xr,xi)

!      Write (nout,*)
!      Write (nout,*) ' XR    XI    Y'
!      Write (nout,99999) xr, xi, y

99999 Format (1X,2F6.1,F9.4)
End Program a02abfe

```

10.2 Program Data

```

A02ABF Example Program Data
-1.7 2.6

```

10.3 Program Results

```

A02ABF Example Program Results

```

XR	XI	Y
-1.7	2.6	3.1064
