

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 $a\sqrt{1 + \left(\frac{b}{a}\right)^2}$ 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 Parameters

1:	XR – REAL (KIND=nag_wp)	<i>Input</i>
2:	XI – REAL (KIND=nag_wp)	<i>Input</i>

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 Further Comments

None.

9 Example

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

9.1 Program Text

```

Program a02abfe

!   A02ABF Example Program Text
!
!   Mark 24 Release. NAG Copyright 2012.
!
!   .. 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

```

9.2 Program Data

```

A02ABF Example Program Data
-1.7 2.6

```

9.3 Program Results

```

A02ABF Example Program Results

   XR   XI   Y
-1.7   2.6  3.1064

```
