NAG Toolbox

nag_complex_abs (a02ab)

1 Purpose

nag_complex_abs (a02ab) returns the value of the modulus of the complex number $x = (x_r, x_i)$.

2 Syntax

```
[result] = nag_complex_abs(xr, xi)
[result] = a02ab(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 $\left(x_r^2 + x_i^2\right)$.

4 References

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

5 Parameters

5.1 Compulsory Input Parameters

1: **xr** – REAL (KIND=nag_wp)
2: **xi** – REAL (KIND=nag_wp)

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

5.2 Optional Input Parameters

None.

5.3 Output Parameters

1: **result**

The result of the function.

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

```
function a02ab_example

fprintf('a02ab example results\n\n');

xr = -1.7;
xi = 2.6;
x = xr + i*xi;

[absx] = a02ab(xr, xi);

fprintf('The modulus of ');
disp(x);
fprintf('            is ');
disp(absx);
```

9.2 Program Results

```
a02ab example results

The modulus of   -1.7000 + 2.6000i

            is     3.1064
```