

## Complex Numbers on the Graphics

*This assumes the newer dark blue versions of the graphics. The old green ones don't have most of these features.*

Using  $i = \boxed{\text{SHIFT}}\boxed{0}$  will allow you to type imaginary numbers in rectangular form.

**NB:** the  $i$  has changeable priorities in BEDMAS, which requires **very** careful use of functions. For example “ $\sqrt{3i}$ ” gives  $\sqrt{3i}$  not  $\sqrt{3}i$  as you usually want, but  $4i^2$  is  $4(i)^2 = -4$ , not  $(4i)^2 = -16$ . Take care to **always** insert ( ) or  $\times$  to always ensure you get exactly what you want with  $i$ .

Using  $\angle = \boxed{\text{SHIFT}}\boxed{\text{X},\theta,\text{T}}$  will allow you to type imaginary numbers in polar form. Note that if you are using a calculation for the angle (e.g.  $\pi/4$ ) then this will need to be bracketed.

Do not assume, however, that any calculation is going to be the format you need. In particular negatives are dealt with slightly differently depending on whether they are polar or rectangular.

To store any number: with it showing press the  $\boxed{\rightarrow}$  button then  $\boxed{\text{ALPHA}}$  and then select a letter (in red). From that point  $\boxed{\text{ALPHA}}$ -letter will return that value. I advise that all but the simplest complex numbers are “stored” to speed awkward calculations and avoid the risk of having to retype complicated expressions from scratch. Also this means functions work on all the stored complex number in a predictable way, e.g.  $3i \rightarrow A$ , then  $A^2 = -9$ , as it is  $(3i)^2$ , whereas  $3i^2 = -3$ .

In the RUN menu, SET UP =  $\boxed{\text{SHIFT}}\boxed{\text{MENU}}$  changes the form in which complex numbers are displayed. (Set-up also changes between degrees and radians. Keep the default of radians.)

Likewise, in the EQUATION menu SET UP =  $\boxed{\text{SHIFT}}\boxed{\text{MENU}}$  allows you to specify which format of complex numbers (or none) are found when solving polynomials.

RUN menu  $\boxed{\text{OPTN}}$  then **F3 (CPLX)** gets the complex number options. (Some require **F6** as well.)

**i** inserts the number  $i$ .

$\triangleright r\angle\theta$  and  $\triangleright a+bi$  placed after a number, then entered, convert to and from polar form.

**Abs** and **Arg** return the modulus (absolute value) and argument (angle) to convert to polar form.

**ReP** and **ImP** do the reverse – finding the real and imaginary parts from polar form.

**Conj** returns the conjugate, in either polar or rectangular form.