Complex Numbers

A complex number is a number with both a real and an imaginary part.

Ex:

A number written in the form above (standard form) is like a vector written in Cartesian from. This form is useful for adding and subtracting complex numbers.

Ex: Given A = 3 + i2 and B = -4 + i3, what is A+B and A-B

A complex number can also be written in a form similar to the polar form of a vector with a magnitude and an angle (in radians). This form is called Euler (pronounced “Oiler”) form.

Ex:

The complex exponential function in Euler’s form is directly related to the cosine and sine function by the equation:

Proof:

We can prove Euler's relationship using the series definitions of the sine, cosine, and exponential function which you should have learned previously in your math courses.

$\cos x =$

$\sin x =$

$e^x =$

The Euler form is very useful when multiplying or dividing complex numbers.

Ex: $A = 5\, e^{i\pi/2}$ and $B = 2\, e^{i\pi/4}$ what is A*B and A/B

We can also use the Euler form to find all the roots (real and complex).