Complex Numbers

Definiton: A complex number is a number that can be written in the form a + bi where a and b are real numbers and $i = \sqrt{-1}$.

Definition: Two complex numbers a + bi and c + di are **equal** if and only if a = c and b = d.

Definiton: The **real component** of the complex number a + bi is a.

Definiton: The **complex component** of the complex number a + bi is b.

Definiton: The sum of two complex numbers a + bi and c + di is defined by (a + bi) (c + di) = (a + c) + (b + d)i

Definiton: The opposite of a complex number a + bi is the complex number -a - bi

Definiton: The difference (a + bi) - (c + di) is defined in terms of subtraction

Subtraction of Complex Numbers



Definiton: The **product** of two complex numbers a + bi and c + di is defined by (a + bi)(c + di) = (ac - bd) + (bc + ad)i

Definiton: The **norm** of a complex number a + bi is $a^2 + b^2$ The norm of a complex number is a positive real number

Definiton: The **conjugate** of a complex number a + bi is a - bi

Definiton: The **quotient** of a complex number a + bi divided by a real number d is defined by $\frac{a+bi}{d} = \frac{a}{d} + \frac{b}{d}i$

Definiton: The multiplicative inverse of a complex number a + bi is $\frac{a - bi}{a^2 + b^2}$

The multiplicative inverse of a complex number is therefore its conjugate divided by its norm.

Definiton: The quotient $(a + bi) \div (c + di)$ is defined in terms of multiplication

Division of Complex Numbers



Definiton: The graph of a complex number a + bi is the point (a, b).

The distance from the origin to a complex number a + bi is the square root of the norm of the complex number. That is $\sqrt{a^2 + b^2}$