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

$$(a+bi)-(c+di)$$

Inverse Operation

Additive Inverse

$$(a+bi)+(-c-di)=(a-c)+(b-d)i$$

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) ÷ (c + di) is defined in terms of multiplication

Division of Complex Numbers

$$(a+bi)\div(c+di)$$

Inverse Operation

Multiplicative Inverse

$$a+bi\bullet\frac{c-di}{c^2+d^2}=\frac{(a+bi)(c-di)}{c^2+d^2}$$

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 $\sqrt{a^2+b^2}$