Complex Numbers

Definitions

- ◊ i^2 = -1, so $i = \sqrt{-1}$. Thus $\sqrt{-b} = i\sqrt{b}$, if b is a positive number.
- ◊ An **imaginary number** is a number which is the square root of a negative number.
- ◊ A number of the form "a + bi" is called a **complex number**, where a & b are real numbers. We call **a** the real part & **b** the imaginary part.
- ◊ Note the set of Real Numbers are a subset of the Complex Numbers.
- ◊ The complex number a – bi is called the **complex conjugate** of a + bi.
- ◊ Two complex numbers are **equal** if the real parts and the imaginary parts are equal.

Examples:

$\sqrt{-9} = 3i$

3 + 2i, 4 + 0i = 4 both are Complex Numbers.

4 + 3i & 4 - 3i are complex conjugates.

a + bi = 3 - 4i if a = 3 and b = - 4

$i^3 = i^{2+1} = i^2 i = (-1)*i = -i$

$i^{14} = i^{2*7} = (-1)^7 = -1$

One of the reasons for studying complex numbers is when solving some polynomials they come up as the solution.

Conjugate Pairs Theorem: If P(x) = 0 is a polynomial equation with real or complex coefficients and the complex number a + bi (b not = 0) is a root, then so is a – bi.

NOTES:

- When solving polynomials complex numbers come in pairs.
- Linear Equations cannot have a complex root.
- Quadratic have 2 complex roots, 2 real roots or one double real root, since a quadratic must have 2 roots.

We will see this when we solve Quadratic Equations with methods other than Factoring.