1.6 Perform Operations with Complex Numbers

Monday, October 16, 2017 6:53 AM

X^2=-1 has NO REAL number solutions because the square of any real number x is never a negative number.

To overcome this problem, mathematicians created an expanded system of numbers using the imaginary unit i, defined as $i = \sqrt{-1}$

The square root of a negative number

Property	Example
1. If r is a positive real number, then $\sqrt{-r} = i\sqrt{r}$	$\sqrt{-3} = i\sqrt{3}$
2. By property (1), it follows that $(i\sqrt{r})^2 = -r$	$(i\sqrt{3})^2 = i \cdot 3 = -3$

Solve a Quadratic Equation

$2x^2+11=-37$	Subtract 11
$2x^2=-48$	Divide by 2
$X^2=-24$	Square Root
$x=\pm\sqrt{-24}$	Write in term of i (pull out negative under the radical)
$x=\pm i\sqrt{24}$	Simplify the radical
$x=\pm 2i\sqrt{6}$	

Complex Number: $a + bi$ a is the real part, bi is the imaginary part

Multiply Complex Numbers

$(9-2i)(-4+7i)$	FOIL
$-36+63i+8i-14i^2$	Simplify, Replace i^2 *with* -1
$-36+71i-14(-1)$	Simplify
$-36+71i+14$	Combine like terms
$-22+71i$	

Divide Complex Numbers

$\frac{7+5i}{1-4i}$	Multiply numerator and denominator by the complex conjugate
$\frac{7+5i}{1-4i} \cdot \frac{1+4i}{1+4i}$	FOIL FL
$\frac{-13+33i}{17}$	

Plot Complex numbers: real-x value imaginary-y value

3-2i	(3,-2i)
-2+4i	(-2,4)
5i	(0,5)
-7	(-7,0)

Absolute Value: $=\sqrt{a^2+b^2}$

3-4i

$\sqrt{3^2+(-4)^2}$

$\sqrt{9+16}$

$\sqrt{25}$

5