Expand this: $(x + 5)^2$

$x^2 + 10x + 25$

	x	$+5$
x	x^2	$+5x$
$+5$	$+5x$	$+25$

$(x + 5)^2$ is never just 2 terms!!!

$(a + b)^2 = a^2 + 2ab + b^2$

$(x + 5)^2 = (x)^2 + 2(1)(5)x + (5)^2$

$= x^2 + 10x + 25$

Exand:

$(2x - 3)^2$

$4x^2 - 12x + 9$

Expand this:

$(1 + 5i)^2$

$1 + 10i + 25i^2$

$1 + 10i + 25(-1) = -24 + 10i$

However,

When you square a complex number you get another complex number.

In other words $(a + bi)^2$ is ALWAYS just 2 terms (a binomial)

$(3 - 4i)^2 =$

$9 - 24i + 16i^2$

$9 - 24i - 16$

$-7 - 24i$

Expand:

$(2x - 3)(2x + 3) =$

	$2x$	$+3$
$2x$	$4x^2$	$+6x$
-3	$-6x$	-9

$4x^2 - 9$

Factors such as $(a + b)$ and $(a - b)$ are called CONJUGATES

Conjugate

The conjugate is where we **change the sign in the middle** of two terms like this:

$3x + 1$

Conjugate: $3x - 1$

The product of Complex Conjugates:

Simplify. $(4 + 2i)(4 - 2i)$

	4	$+2i$
4	16	$+8i$
$-2i$	$-8i$	$-4i^2$

$16 - 4i^2$

$16 - 4(-1)$

$16 + 4$

20

$(a + b)(a - b) = a^2 - b^2$

Complex Conjugates: $a + bi$ and $a - bi$

$(4 + 2i)(4 - 2i) = 20$

With Imaginary Numbers:

$(a + bi)(a - bi) = a^2 + b^2$

$(a - bi)(a + bi)$

$(2 - 3i)(2 + 3i) =$

$= (2)^2 - (3i)^2$

$= 4 - 9i^2$

$= 4 - 9(-1)$

$= 4 + 9 = 13$

$4 + 9 = a^2 + b^2$

$(7 + 4i)(7 - 4i) =$

$7^2 + 4^2$

$49 + 16 = 65$

The product of complex conjugates is always

a constant

Simplify each.

1. $(9 - 5i)^2$

$81 - 90i - 25$

$56 - 90i$

2. $(6 - 3i)(6 + 3i)$

$36 + 9$

45

$i = \sqrt{-1} = i$

$i^2 = -1$

$i^3 = -i$

Simplify:

$(7i)(6i)(10i)$

$420i^3$

$420(-i) = -420i$

$i = \sqrt{-1} = i$

$i^2 = -1$

$i^3 = -i$

$i^4 = 1$

This pattern repeats every 4 powers of i.

$i^5 = i$

$i^6 = -1$

$\vdots$

$i^{25} = i$

take the exponent and divide by 4. The remainder indicates how far into the next 4 you are.

$25 \div 4 = 6$, r = 1 ($4 \cdot 6 = 24$, $25 - 24 = 1$)

this indicates that i^{25} has passed through the pattern 6 complete times and the remainder indicates that it is the 1st step into the next patter. $i^{25} = i^1 = i$

Hwk #23: Sec 5-6

Due Tomorrow

Pages 278-279

Problems 3-5, 13, 14, 34-36, 40, 57, 59, 65

Find ALL solutions using Square Roots:

$(x + 1)^2 + 21 = 5$

$-21 \quad -21$

$\sqrt{(x+1)^2} = \sqrt{-16}$

$x+1 = \pm 4i$

$-1 \quad -1$

$x = -1 \pm 4i$

Now, all quadratic equations have solutions.

Some of these solutions may be imaginary.