Present Wednesday: #27, 47, 61
9:55 Alyssa Fro., Molly, Kaitlin, Kaitlyn, Mandi, Grace Jar.
11:00 Elizabeth Lin., Kamry, Caitlyn, Gen, Danielle, Steve Mil.

Sec. 7.6 - Polynomials & Factoring

HW from yesterday: Four problems on handout.

HW 7.6 #5, 11, 15 , 18, 31, 35, 46-52 all, 63, 64, 65, 66, 71, 72, 75, 76, 91, 99, 100.

Present tomorrow: #35, 52, 91
9:55 Molly Kas., Azjja, Katie, Megan, Katie, Alyssa Nei.
11:00 Emily New., Jordan, Kyle, Rebecca, Emma, Jamie Sag.

61. $.35d + .14m < .34d + .16m$

$d < .02m$

If $d = 1$:

$1 < .02m$

$50 < m$

After 50 miles

Loose End from Yesterday...

Absolute Values and Inequalities:

Recall that $|x| = \begin{cases} x & if\ x \ge 0 \\ -x & if\ x < 0 \end{cases}$

$|5| = 5$

$|-3| = -(-3) = 3$

Which values of x make the following true?

$|x| < 3 \Rightarrow -3 < x < 3$

-3 0 3

$|x| > 5 \Rightarrow \cancel{-5 > x > 5}$?

$x < -5$ OR $x > 5$

$(-\infty, -5) \cup (5, \infty)$

-5 0 5

$|x - 3| < 2 \Rightarrow -2 < x-3 < 2$

$\Rightarrow 1 < x < 5$

1 3 5

$|2x + 1| > 2 \Rightarrow$

$2x+1 < -2$ OR $2x+1 > 2$

$2x < -3$ $\quad$ $2x > 1$

$x < -\frac{3}{2}$ OR $x > \frac{1}{2}$

$-\frac{3}{2}$ 0 $\frac{1}{2}$

A) Mistake? Here's how Charles solved $|2x + 3| < 5$. Can you find his mistake? What is the correct solution?

$|2x + 3| < 5$
$\Rightarrow |2x| < 2$
$\Rightarrow |x| < 1$
$\Rightarrow \cancel{-4 < x < 4}$

$-1 < x < 1$

order of operations violated!

$|2x+3| < 5$

$-5 < 2x+3 < 5$

$-8 < 2x < 2$

$-4 < x < 1$

B) Mistake? Here's how Katrina solved $|4 - x| > 3$. Can you find her mistake? What is the correct solution?

$|4 - x| > 3$
$\Rightarrow 4 - x > 3$ or $4 - x < -3$
$\Rightarrow -x > -1$ or $-x < -7$
$\Rightarrow x < 1$ or $x > 7$
$\Rightarrow \cancel{1 > x > 7}$

$(-\infty, 1) \cup (7, \infty)$

1 7

7.6 - Polynomials and Factoring

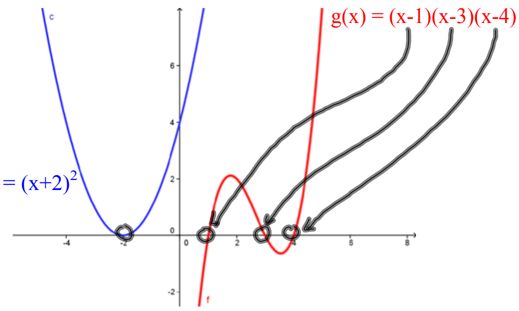
Definition: A **term** (or **monomial**) is a number, a variable, or a product of numbers and variables.
Definition: A **polynomial** is a term or finite sum or difference of terms, with only nonnegative integer exponents permitted on the variables.

But... what *is* a polynomial?

Examples:	Non-Examples:
$x^2 + 2x + 1$	$x^{1/2} + 3x$
$3x - 2$	$3x^{-2} + 4x^{-1} - 9$
$x^3 + 3x^2 - 2x - 8$	$\|2x - 4\|$
$a^2 + 2ab + b^2$	

Polynomials functions and graphs:

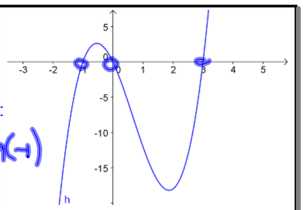
The graphs of some **polynomial functions** appear below.
When in factored form, the *zeros* (*roots, x-intercepts*) are apparent.



Verify that $3x(x + 1)(x - 3)$ is the factored form of the polynomial $3x^3 - 6x^2 - 9x$.

$x=0$ $x=-1$ $x=3$

(Quick test: Plug in individual points):



Check -1: $3(-1)^3 - 6(-1)^2 - 9(-1)$
$0 \overset{?}{=} -3 - 6 + 9$ ✓

To be sure: Expand the product and simplify to show that it is equivalent to the polynomial.

$3x(x+1)(x-3)$ FOIL
$= 3x(x^2 - 3x + x - 3)$
$= 3x(x^2 - 2x - 3)$
$= 3x^3 - 6x^2 - 9x$ ✓

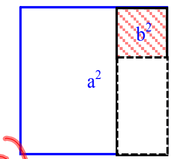
Factoring Polynomials

There are several methods for factoring polynomials.

1. Special cases - difference of squares, perfect square trinomials
2. Factor by grouping (and the "ac method")
3. Tic-tac-toe and CFQ method - tomorrow

Special cases.

✔ Difference of squares:
$a^2 - b^2 = (a + b)(a - b)$



Ex: Factor completely:

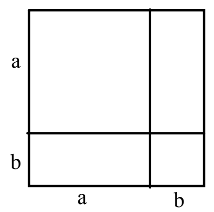
a) $9x^2 - 25$
$= (3x)^2 - 5^2 = (3x+5)(3x-5)$

b) $12x^3 - 27x$
$= 3x(4x^2 - 9)$
$= 3x(2x+3)(2x-3)$

Factoring Polynomials: A few special cases.

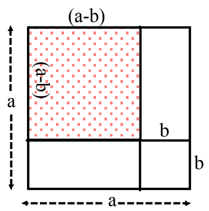
✔ Perfect Square Trinomials:

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



✔ Perfect Square Trinomials:

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



Factoring Polynomials: A few special cases.

✔ Perfect Square Trinomials:

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

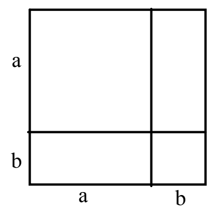
$a^2 - 2ab + b^2 = (a-b)^2$

Example: Fill in the blank in the polynomial below so that it is a perfect square trinomial. Then factor it completely.

$x^2 + 12x +$ ___

✘ Sum of squares:

$a^2 + b^2 = ????$



Factoring by Grouping (or, The AC Method)

To factor $ax^2 + bx + c$, two factors p and q of ac that add to b.
Rewrite as $ax^2 + (px + qx) + c$, and factor the gcf from each group.

$ax^2 + \quad bx \quad + c$

Example: $3x^2 + 5x - 12$

$= 3x^2 + \quad 5x \quad - 12$

$= \underbrace{3x^2 + 9x}\underbrace{-4x - 12}$

$= 3x(x+3) - 4(x+3)$

$= (x+3)(3x-4)$

a = 3 c = -12

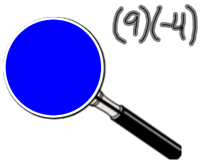
ac = -36

target sum: 5x

$(-12)(3) = -36$

$(12)(-3)$

$(9)(-4) = -36$



Which polynomials can be factored? Consider...

a) Can $3x^2 + 7x - 12$ be factored?

b) List all integer values of b for which the trinomial $3x^2 + bx - 12$ can be factored.

More practice: Factor the following trinomials.

c) $6x^2 + 11x + 3$

$\underbrace{6x^2 + 9x} + \underbrace{2x + 3}$ $ac = 18$

$3x(2x+3) + (2x+3)$

$(2x+3)(3x+1)$

d) $6x^2 - 5x - 4$

$\underbrace{6x^2 - 8x} + \underbrace{3x - 4}$ $ac = -24$

$(-8)(3)$

$2x(3x-4) + 1(3x-4)$

$(2x+1)(3x-4)$

e) $x^2 + 3x - 4$

f) $x^2 + 4x + 3$

g) $x^2 - 16$