Algebra 1: 12.4 Guided Notes **Name** _____ **Period** _____
Solving Quadratics by Factoring

Warm Up – Turn and Talk
Turn and talk to your neighbor. Describe what it means to *factor* a polynomial. Your explanation should include terms like *polynomial*, *factor*, and *multiply*. Be prepared to discuss your thoughts with the class.

Notes

Recall, the **Zero Product Property** states if the product of 2 or more factors = 0, then at least 1 of the factors = 0.

If $ab = 0$, then $a = 0$ or $b = 0$.

"I Do"

Factor the polynomial $x^2 - 4x - 5 = 0$. Then, use the Zero Product Property to determine the solutions or *x*-intercepts.

$x^2 - 4x - 5 = 0$		Factor the quadratic equation.
$(x - 5)(x + 1) = 0$		Set each binomial factor = 0.
$x - 5 = 0$	$x + 1 = 0$	Solve for the variable (x).
$x = 5$	$x = -1$	

The *x*-intercepts are (5, 0) and (–1, 0).

Graph the solutions to the quadratic equation $y = x^2 - 4x - 5$ on the coordinate plane. Find the *x*-intercept(s), axis of symmetry, and vertex.

***x*-intercept(s):** (5, 0) & (-1, 0)

axis of symmetry: $x = \frac{-1+5}{2} = \frac{4}{2} = 2$

Find the point halfway between the *x*-intercepts.

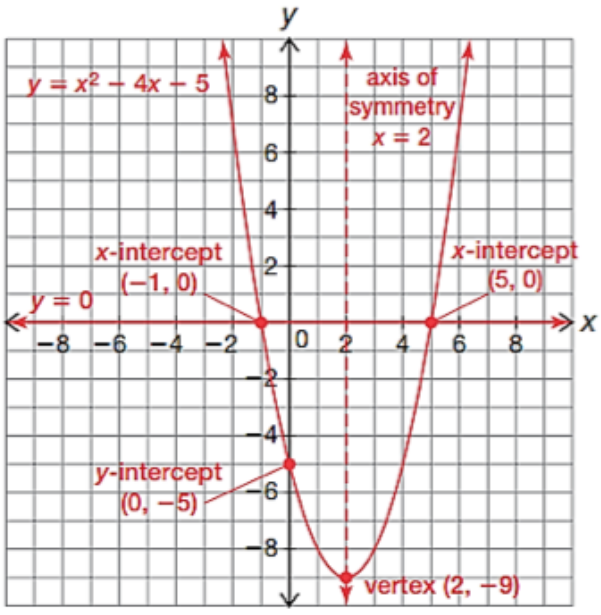
vertex: (2, -9)

Let $x = 2$ and solve for y.

$y = 2^2 - 4(2) - 5$

$y = 4 - 8 - 5$

$y = -9$



The *x*-intercepts are the solutions to the quadratic equation.

They are also called the zeros or roots because you set the quadratic equation = 0 and solve for *x*.

On the coordinate plane, the *x*-intercepts are where the parabola crosses the *x*-axis.

"We Do"

Factor each polynomial to determine the solution(s) or *x*-intercept(s), if possible. Then, graph the solution(s).

1. $x^2 + 8x = -7$

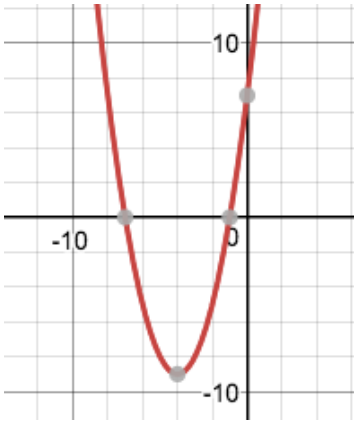
$x^2 + 8x + 7 = -7 + 7$

$x^2 + 8x + 7 = 0$ Set the equation equal to 0.

$(x+1)(x+7) = 0$ Factor.

$x + 1 = 0$ or $x + 7 = 0$ Set each binomial factor = 0.

$x = -1 \qquad x = -7$ Solve for *x*.



***x*-intercept(s):** (–1, 0) & (–7, 0)

axis of symmetry: $x = \dfrac{-1+(-7)}{2} = \dfrac{-8}{2} = -4$

vertex: (-4, -9)

$(-4)^2 + 8(-4) + 7$

$16 - 32 + 7$

-9

2. $x^2 - 5x = 13x - 81$

$x^2 - 5x - 13x = 13x - 13x - 81$

$x^2 - 18x = -81$

$x^2 - 18x + 81 = -81 + 81$

$x^2 - 18x + 81 = 0$

$(x-9)(x-9) = 0$

$x - 9 = 0$ or $x - 9 = 0$

$x = 9 \qquad x = 9$

***x*-intercept(s):** (9, 0)

axis of symmetry: $x = 9$

vertex: (9, 0)

$9^2 - 18(9) + 81$

$81 - 162 + 81$

0

3. $x^2 - 11x + 12$

No real solution.

x-intercept(s):

axis of symmetry: $x =$

vertex:

4. $2x^2 + 4x$

$2x^2 + 4x = 0$ *Factor out the GCF!*

$2x(x+2) = 0$

$2x = 0$ or $x + 2 = 0$

$x = 0 \qquad x = -2$

x-intercept(s): (0, 0) & (–2, 0)

axis of symmetry: $x =$ $\dfrac{0+(-2)}{2} = \dfrac{-2}{2} = -1$

vertex: (–1, –2)

$2(-1)^2 + 4(-1)$

$2 - 4$

-2