Warm Up

Factor the following numbers and expressions

1. 36

2. $36x^3 + 48x^2 + 24x$

Multiply the following factors using either FOIL or Box Method

3. $(3x - 2)(x - 1)$

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

Quadratics - Factoring

Objectives

Recognize standard and vertex form of a quadratic equation.

Put quadratic equations in standard and vertex form.

Factor quadratic equations in standard form

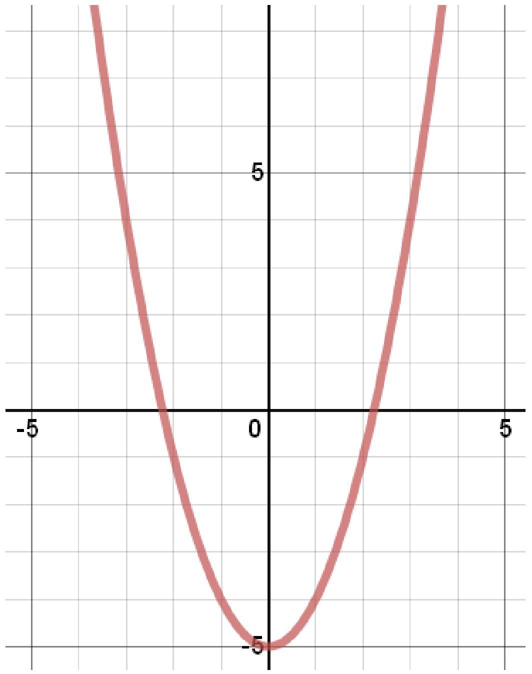
Homework

Packet Page 39: 4-20 EOE (every other even)
Packet Page 40: 26, 28, 32, 33

Quadratic functions are transformations of the parent quadratic function, $y=x^2$.

The graph of all quadratic functions is a **parabola.**

Quadratics - Factoring



The **vertex form** of a quadratic function is

$$f(x) = \pm a(x - h)^2 + k$$

The **axis of symmetry** is a line that divides the parabola into two mirror images .

The equation of the axis of symmetry is $x = h$.

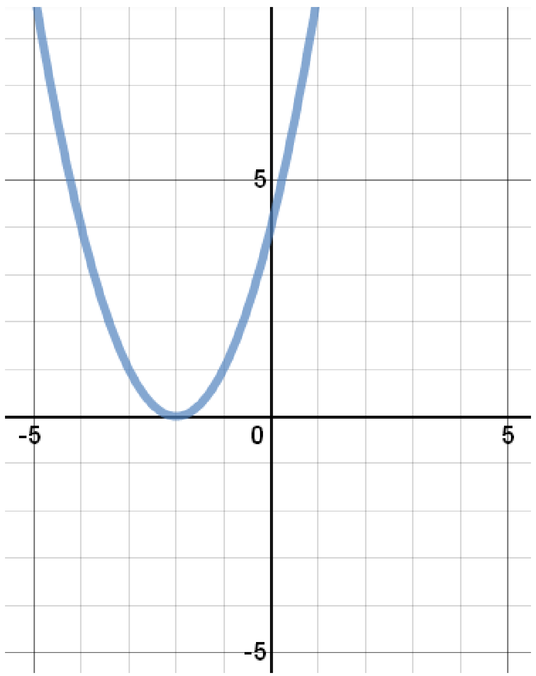
Vertex: $(0, -5)$

Axis of Symmetry: $(x = 0)$

Function Equation: $f(x) = x^2 - 5$

The **vertex** of the parabola is (h, k), the intersection of the parabola and its axis of symmetry.

Quadratics - Factoring



The **vertex form** of a quadratic function is

$$f(x) = \pm a(x-h)^2 + k$$

The **axis of symmetry** is a line that divides the parabola into two mirror images .

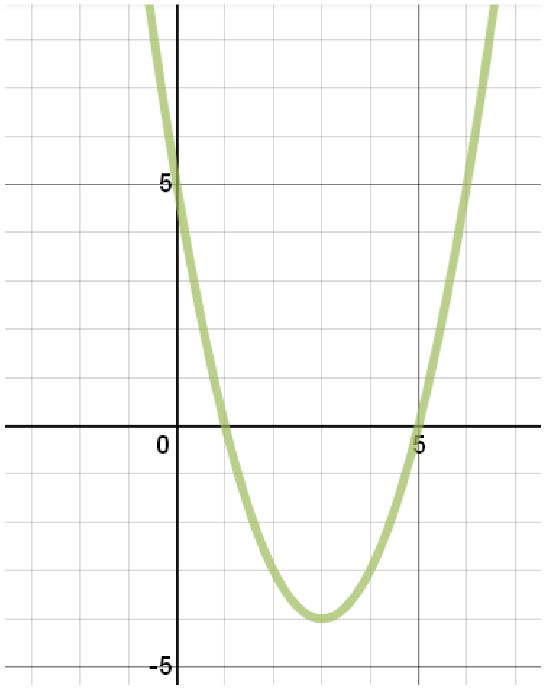
The equation of the axis of symmetry is $x = h$.

Vertex: $(-2, 0)$

Axis of Symmetry: $x = -2$

Function Equation: $f(x) = (x+2)^2$

The **vertex** of the parabola is (h, k), the intersection of the parabola and its axis of symmetry.



The **vertex form** of a quadratic function is

$$f(x) = \pm a(x-h)^2 + k$$

The **axis of symmetry** is a line that divides the parabola into two mirror images .

The equation of the axis of symmetry is $x = h$.

Vertex: $(3, -4)$

Axis of Symmetry: $x = 3$

Function Equation: $f(x) = (x-3)^2 - 4$

The **vertex** of the parabola is (h, k), the intersection of the parabola and its axis of symmetry.

Quadratics - Factoring

The **standard form** of a quadratic function is

$$f(x) = ax^2 + bx + c$$

$$f(x) = 2x^2 - 8x + 1$$

The **axis of symmetry** is a line that divides the parabola into two mirror images .

The equation of the axis of symmetry is $x = -\frac{b}{2a}$.

$$x = -\frac{-8}{2(2)} = 2$$

The **x coordinate** of the **vertex** is $-\frac{b}{2a}$.

$$x = 2$$

The **y coordinate** of the **vertex** is $f(-\frac{b}{2a})$.

$$y = f(2)$$

$$y = 2(2)^2 - 8(2) + 1$$

$$y = -7$$

Vertex is $(2, -7)$

Practice

In your packets, do problems 5, 11 and 12 on page 20.

5.

11.

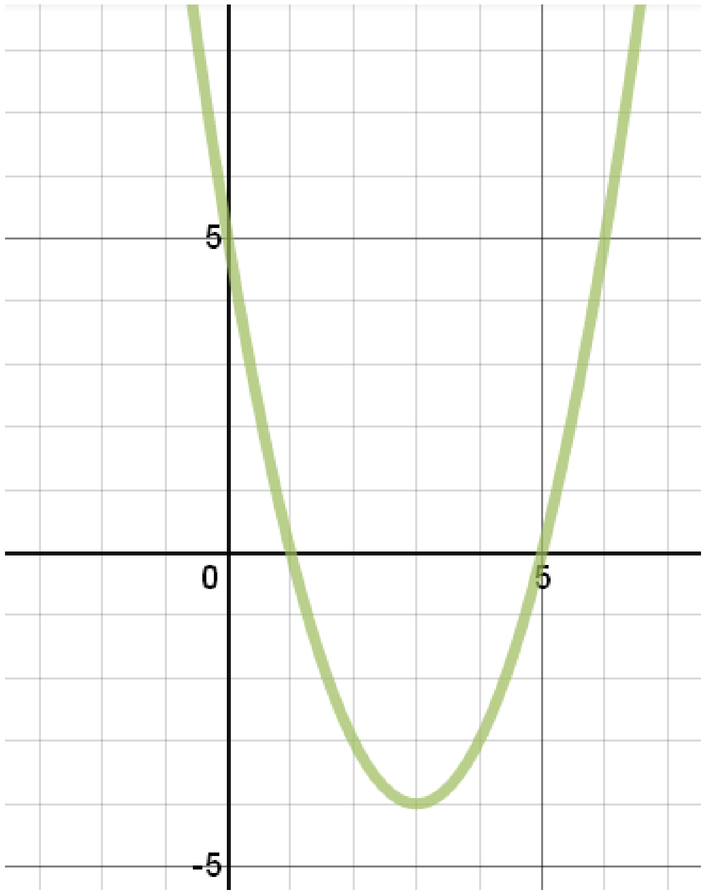
12.

So what does all this have to do with factoring?

Factoring is a tool we use to find the x-intercepts of a quadratic function.

What is the y value of the coordinates of any x-intercept?

X-intercepts are sometimes referred to as the zeros of a quadratic function or the roots.



Quadratics - Factoring

Factoring is basically FOIL (or the box method) in reverse

$$(x + 2)(x + 7)$$

When we expand these factors we end up with

$$x^2 + 9x + 14$$

Our objective is to go from Standard form to Factored Form

$$x^2 + 11x + 24$$

Factors of 24	Sum of the factors
1·24	1 + 24 =25
2·12	2 + 12 =14
3·8	3 + 8 =11
4·6	4 + 6 =10

So which factor pair becomes a part of our pair of factors?

$$(x + \underline{3})(x + \underline{8})$$

Our objective is to go from Standard form to Factored Form

$$x^2 - 11x + 24$$

Factors of 24	Sum of the factors
(-1)(-24)	-1 - 24 =-25
(-2)(-12)	-2 - 12 =-14
(-3)(-8)	-3 - 8 =-11
(-4)(-6)	-4 - 6 =-10

So which factor pair becomes a part of our pair of factors?

$$(x - \underline{3})(x - \underline{8})$$

AC Method for $a \neq 1$

Step 3: Find factors of a · c that sum up to b.

$$6x^2 - 11x - 7$$

Factors of a · c = 30	Sum of the factors
$1(-42)$	$1 - 42 = -41$
$2(-21)$	$2 - 21 = -19$
$3(-14)$	$3 - 14 = -11$
$6(-7)$	$6 - 7 = -1$

Step 4: Replace $-11x$ with the factors found in step 3.

$$6x^2 + 3x - 14x - 7$$

Step 5: Group into two binomial terms.

$$(6x^2 + 3x) + (-14x - 7)$$

Factor out the greatest common factor from each group.

$$3x(2x + 1) + -7(2x + 1)$$

Step 6: Factor out the greatest common factor from the expression.

$$(2x + 1)(3x - 7)$$

SWING Method for $a \neq 1$

$$6x^2 - 11x - 7$$

Step 3: Find factors of a · c that sum up to b.

Factors of a · c = 30	Sum of the factors
$1(-42)$	$1-42=-41$
$2(-21)$	$2-21=-19$
$3(-14)$	$3-14=-11$
$6(-7)$	$6-7=-1$

Step 4: Set up the function factors with the factors identified in step 3. Divide each factor by the value of a and simplify.

$$\left(x+\frac{3}{6}\right)\left(x+\frac{-14}{6}\right)$$

$$\left(x+\frac{1}{2}\right)\left(x-\frac{7}{3}\right)$$

Step 5: Swing the denominator of any fractions remaining in front of the x term in the factor.

$$(2x+1)(3x-7)$$

Practice

In your packets, do problems 2, 4 and 6 on page 39.

2. **4.** **6.**

Perfect Square Trinomials

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

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

For example…

$$25x^2 - 20x + 4 = (5x - 2)^2$$

But, if you don't recognize these, you can always factor using the methods you already know.

Difference of Squares

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

$$4x^2 - 36 = (2x + 6)(2x - 6)$$

This one, you will need to be familiar with. Differences of squares show up a lot.

Practice

In your packets, do problems 26, 28, 32 and 33 on page 40.

26. **28.** **32.** **33.**

Exit Ticket!

#15 on page 39 of your packet.