

**Day 6 - Graphing Quadratics in Intercept (Factored) Form**

Graph the following equations in standard form and then factor the quadratic equation.

1.  $y = x^2 - 2x + 1$

$A: 1$   
 $B: -2$   
 $C: 1$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(1)}}{2(1)}$

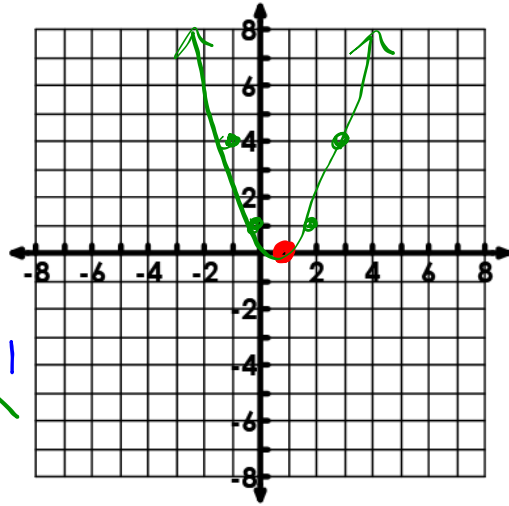
$x = \frac{2 \pm \sqrt{4 - 4}}{2}$

$x = \frac{2 \pm 0}{2}$

$x = 1$

Vertex:  $(1, 0)$

$y = x^2 - 2x + 1$   
 $y = (1)^2 - 2(1) + 1$   
 $y = 1 - 2 + 1$   
 $y = 0$



x	-1	0	1	2	3
y	4	1	0	1	4

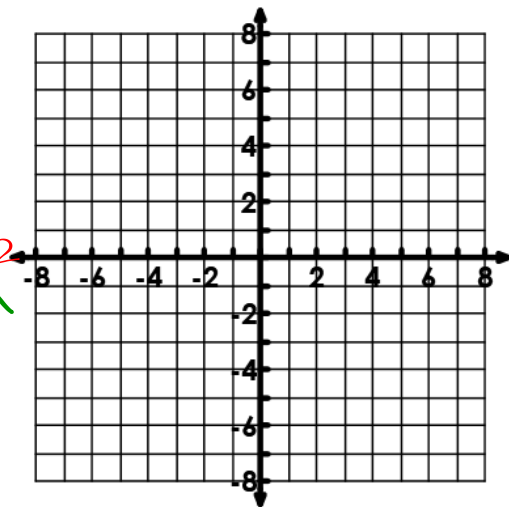
Factored Form:  $y = x^2 - 2x + 1$   
 $y = (x - 1)(x - 1)$

2.  $y = x^2 + x - 6$

Vertex:

x					
y					

Factored Form:  $y = x^2 + x - 6$   
 $y = (x - 2)(x + 3)$



What did you notice about the factored form and the x-intercepts of the graph?  
 $(x - 2) = 0 \Rightarrow x = 2$   
 $(x + 3) = 0 \Rightarrow x = -3$   
 $x = 0$  (cross x-axis)

What do you notice about the x-value of the vertex and the x-intercepts?

We learned in Unit 7 how to factor, but we can also graph in factored form!

**Factored Form of a Quadratic Function:**  
 $y = a(x - p)(x - q)$

$a$  determines how the graph opens

&

The  $x$  - intercepts are  $(p, 0)$  and  $(q, 0)$ .

**Finding the Vertex in Intercept Form**

Graphing in factored form is similar to graphing in standard form, but the way we find our vertex is different. We use a special formula to find the  $x$  - coordinate of our vertex, and substitute that value in our equation to determine the  $y$  - coordinate of our vertex. The formula is:

$$x = \frac{p+q}{2}$$

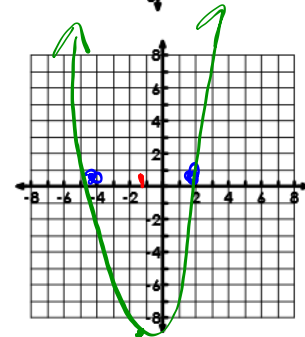
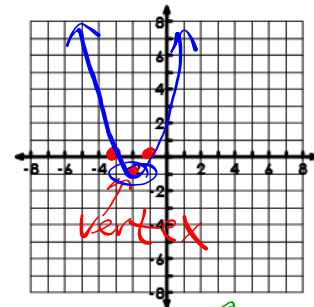
For example, say we have  $y = (x + 7)(x + 1)$ , how would we find our vertex?

**Identifying the Vertex Practice**

Find the vertex for each of the following quadratics and determine the  $x$  - intercepts:

1.  $y = (x+1)(x+3)$   
 Zeros:  $x = -1$  &  $x = -3$   
 $(x+1) = 0 \Rightarrow x = -1$   
 $(x+3) = 0 \Rightarrow x = -3$   
 Vertex:  $(-2, -1)$   
 $y = (-2+1)(-2+3) = (-1)(1) = -1$

2.  $y = (x+4)(x-2)$   
 Zeros:  $x = -4$  &  $x = 2$   
 $x+4 = 0 \Rightarrow x = -4$   
 $x-2 = 0 \Rightarrow x = 2$   
 Vertex:  $(-1, -9)$   
 $y = (-1+4)(-1-2) = (3)(-3) = -9$   
 middle  $x = -1$



Algebra 1  $x=2$   
 3.  $y = -3(x-7)(x+3)$

$y = -3(2-7)(2+3)$   
 $y = -3(-5)(5)$

$y = 75$   
 Vertex =  $(2, 75)$

4.  $y = (x-6)^2$   $(6, 0)$

$y = (x-6)(x-6)$   
 $y = (6-6)^2$   
 $y = 0^2 = 0$   
 Vertex =  $(6, 0)$

Unit 8: Quadratic Functions

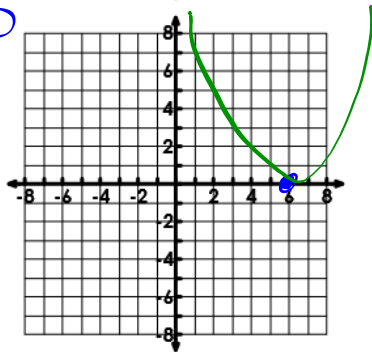
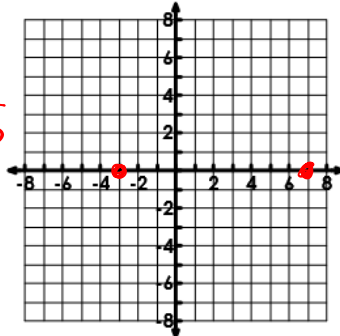
x-intercepts:  $x=7$  &  $x=-3$   
 Zeros:  
 $x-7=0 \quad x+3=0$   
 $+7 \quad +7 \quad -3 \quad -3$   
 $x=7 \quad x=-3$

MIDDLE:  $x=2$

Zeros  
 x-intercepts:  $x=6$

$x-6=0 \quad x-6=0$   
 $x=6 \quad x=6$

Notes



Steps for Graphing in Intercept Form

1. Find the vertex. After using the formula  $x = \frac{p+q}{2}$  to find our x- coordinate of our vertex, we substitute that x back into our equation, and our solution is the y-coordinate of our vertex.
2. Determine your two x - intercepts.
3. Plot your points and connect them from left to right!

Graphing in Factored Form Examples

Example 1: Graph  $y = (x+2)(x-2)$ .  
 $a = 1$   
 Zeros:  $(x+2)=0 \quad (x-2)=0$   
 x-intercepts:  $x=-2 \quad x=2$   
 Vertex: middle  $x=0$   
 $y = (0+2)(0-2)$   
 $y = (2)(-2)$   
 $y = -4$

