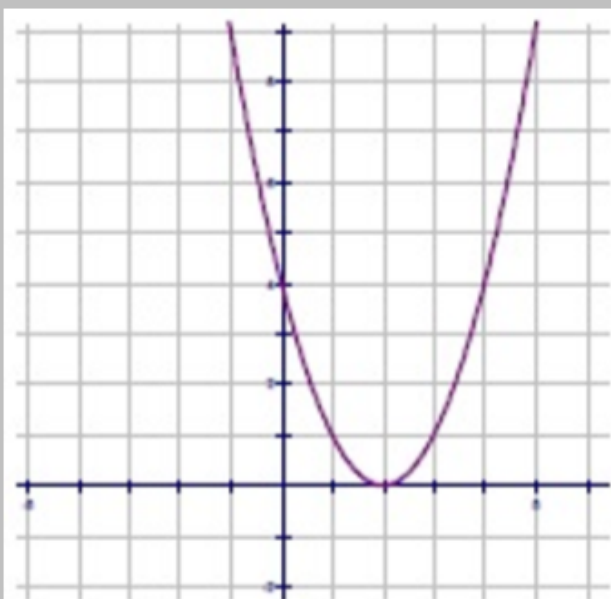


# Warmup:

Identify the following characteristics of the graph below:



D:  $(-\infty, \infty)$  R:  $[0, \infty)$   
 Interval of Increase:  $(2, \infty)$   
 Interval of Decrease:  $(-\infty, 2)$   
 Axis of Symmetry:  $x = 2$   
 Vertex:  $(2, 0)$   
 Max or Min? min at 0  
 End Behavior: As  $x \rightarrow -\infty$ ,  $y \rightarrow \infty$  As  $x \rightarrow \infty$ ,  $y \rightarrow \infty$   
 x-intercept: 2 y-intercept: 4

Positive:  $(-\infty, 2) \cup (2, \infty)$  Negative: N/A

# Quiz #9

E.Q.:

How do we write the equation  
of a quadratic function?

## Recall our different forms:

Standard Form

$$y = ax^2 + bx + c$$

Factored Form

$$y = a(x - r_1)(x - r_2)$$

Vertex Form

$$y = a(x - h)^2 + k$$

Generally when asked to write an equation we will be given:

- the vertex
- another point on the graph.

For that reason, we will use vertex form to write an equation of a parabola.

We can always convert to other forms from there!!

$$y = m x + b$$

$$y = 3x + \underline{b}$$

$$6 = 3(3) + b$$

$$6 = 9 + b$$

$$-9 \quad -9$$

$$\underline{-3} = b$$

line goes through

$$(3, 6) \text{ ; } (5, 12)$$

$$m = \frac{\Delta y}{\Delta x} = \frac{6}{2} = \underline{3}$$

$$y = 3x - 3$$

## Vertex Form

$$y = a(x - h)^2 + k$$

In order to write the equation we must:

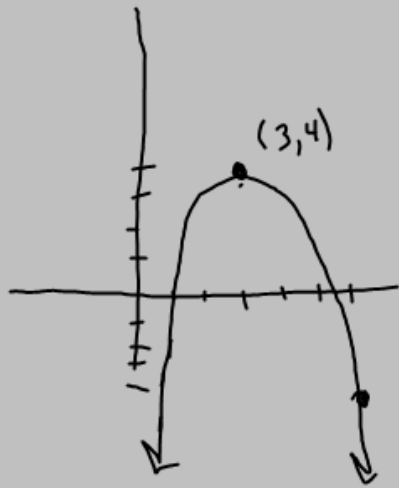
- plug in the vertex (h and k)
- plug in the coordinates of the other point
- solve for a
- write the equation

# Example:

## Vertex Form

$$y = a(x - h)^2 + k$$

Write the equation of the quadratic that has a vertex at  $(3, 4)$  and passes through the point  $(6, -4)$



$$\star y = a(x - 3)^2 + 4 \star$$

$$-4 = a(6 - 3)^2 + 4$$

$$-4 = a(3)^2 + 4$$

$$-4 = 9a + 4 \quad \rightarrow \quad \left. \begin{array}{l} -8 \\ 9 \end{array} \right\} \frac{9a}{9}$$

$$y = -\frac{8}{9}(x - 3)^2 + 4$$



Write the equation of the quadratic function that this table represents:

Vertex Form

$$y = a(x - h)^2 + k$$

$$y = a(x - -1)^2 + 10 \quad \star$$

$$y = a(x + 1)^2 + 10$$

$$13 = a(0 + 1)^2 + 10 \quad \star$$

solve for "a"

$$y = 3(x + 1)^2 + 10$$

x	y
-3	22
-2	13
-1	10
0	13
1	22

-1 vertex

$$13 = a(1)^2 + 10$$

$$13 = 1a + 10$$

$$3 = 1a$$

$$\underline{a = 3}$$

Write the equation of the quadratic function shown in the graph:

### Vertex Form

$$y = a(x - h)^2 + k$$

$$y = a(x - 2)^2 + 4$$

$$0 = a(0 - 2)^2 + 4$$

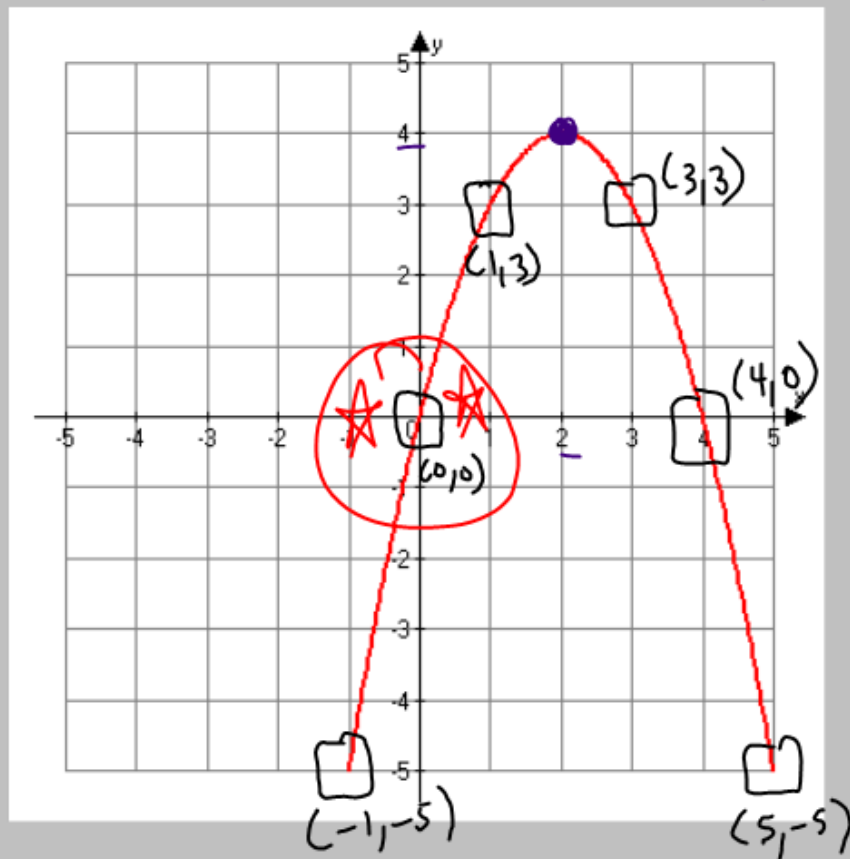
$$0 = a(-2)^2 + 4$$

$$0 = 4a + 4$$

$$-4 \qquad -4$$

$$\frac{-4}{4} = \frac{4a}{4} \quad a = -1$$

vertex (2,4)



$$y = -1(x - 2)^2 + 4$$

Write the equation of the quadratic function  
in standard form:

In order to convert from vertex form to  
standard form we must:

- square our binomial
- distribute our leading coefficient
- combine our like terms

$$(x-2)(x-2)$$

$$x^2 - 2x - 2x + 4$$

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

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

$$y = 2(x^2 - 4x + 4) + 3$$

$$y = 2x^2 - 8x + 8 + 3$$

$$y = 2x^2 - 8x + 11$$

Write the equation of the quadratic function in standard form:

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

$$y = -3(x - 2)^2 - 2$$

$$y = -3(x^2 - 4x + 4) - 2$$

$$y = -3x^2 + 12x - 12 - 2$$

$$y = -3x^2 + 12x - 14$$

# Convert the equation from standard form to vertex form

We've already learned how to do this!!

Anyone remember what process we need to do?

Vertex Form

$$y = a(x - h)^2 + k$$

$$y = 3(x + 4)^2 - 4$$

$$y = 3x^2 + 24x + 44$$

completing the  
square

- or -

$$\frac{-b}{2a} = \frac{-24}{2(3)} = \frac{-24}{6}$$

$$= -4$$

"h"

$$y = 3(-4)^2 + 24(-4) + 44$$

$$y = -4 \quad \text{"k"}$$

You try: Convert to vertex form

$$y = -2x^2 + 12x + 7$$

# HW #11

## Writing equations