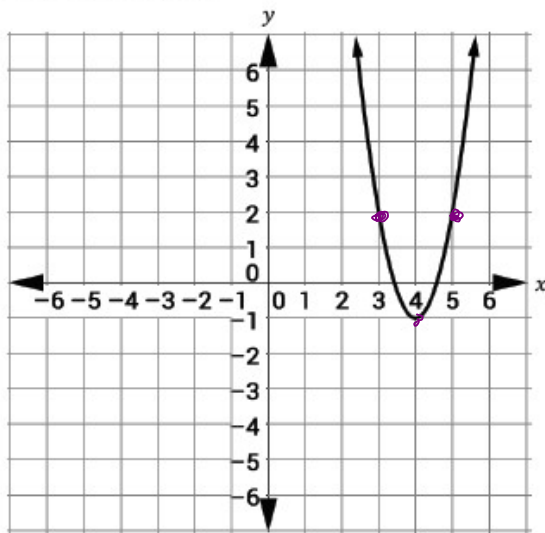


Section 5 – Topic 5
Writing Quadratic Equations in Vertex Form from a Graph

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

Consider the graph below.



To write an equation for a quadratic function in vertex form $y = a(x - h)^2 + k$, what key feature(s) of the graph do you need?

$$(h, k)$$

Identify the vertex.

Substitute the vertex into the vertex form of a quadratic equation.

$$(4, -1)$$

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

Choose a different ordered pair from the graph.

$$(3, 2)$$

Substitute the ordered pair into the equation to solve for a .

$$2 = a(3-4)^2 - 1 \quad 2 = a(-1)^2 - 1$$

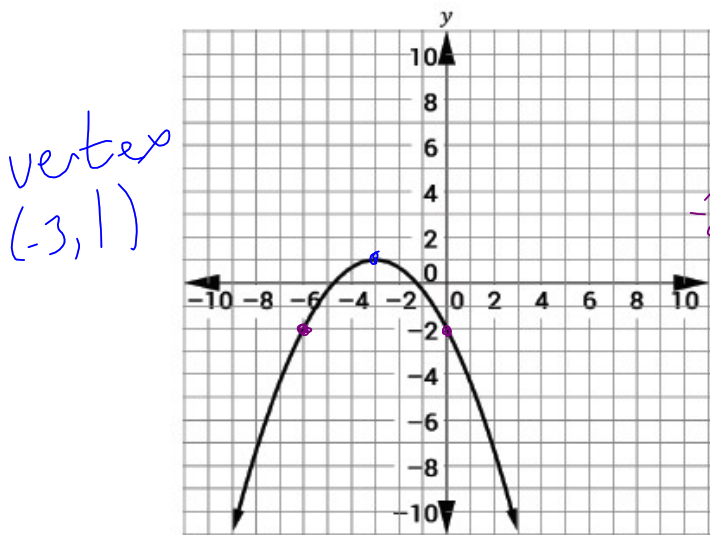
$$2 = a(-1)^2 - 1 \quad +1 \quad a = 3$$

Substitute a , h , and k into the vertex form of a quadratic equation.

$$y = 3(x-4)^2 - 1$$

Try It!

1. Consider the following graph of a quadratic function.



Write the equation, in vertex form, for the quadratic function represented by the graph.

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

(0, -2)

$$-2 = a(0+3)^2 + 1 \quad -2 = a(-6+3)^2 + 1$$

$$-2 = a(3)^2 + 1 \quad -2 = a(-3)^2 + 1$$

$$-2 = 9a + 1 \quad -2 = 9a + 1$$

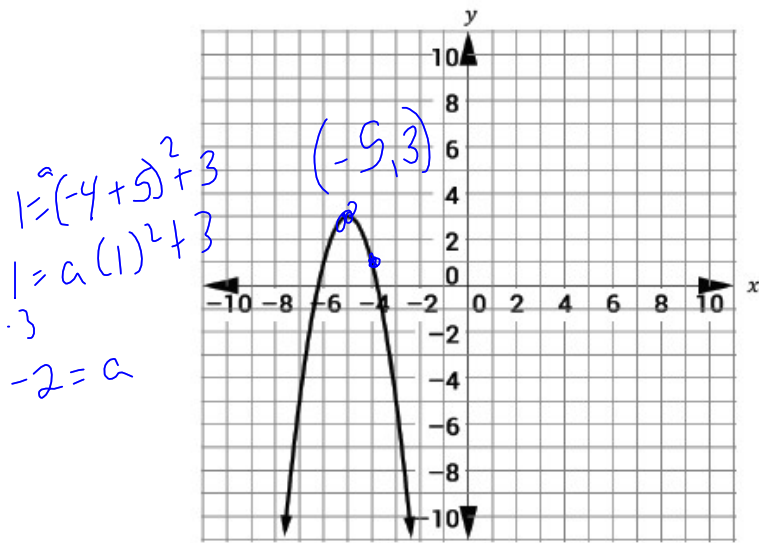
$$\frac{-3}{9} = a$$

$$-\frac{1}{3} = a$$

$$y = -\frac{1}{3}(x+3)^2 + 1$$

BEAT THE TEST!

1. Consider the following graph of a parabola.



$$y = -2(x+5)^2 + 3$$

$$= -2(x^2 + 10x + 25) + 3$$

$$= -2x^2 - 20x - 50 + 3$$

$$= -2x^2 - 20x - 47$$

Which of the following functions is represented in the graph?

- (A) $f(x) = x^2 - 10x + 28$ ~~X~~
- (B) $g(x) = x^2 + 10x + 28$ ~~X~~
- (C) $h(x) = -2x^2 - 20x - 47$
- (D) $m(x) = -2x^2 + 20x - 47$