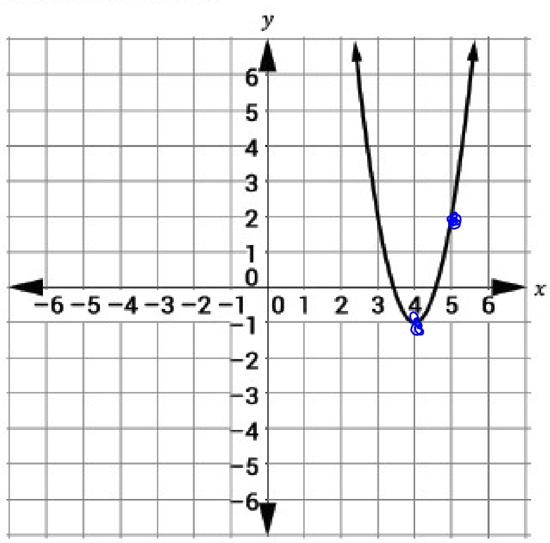
Section 5 – Topic 5
Writing Quadratic Equations in Vertex Form from a Graph

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?

up or down, vertex

Identify the vertex. (h, k) (4, -1)

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

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

Choose a different ordered pair from the graph.

(5, 2)

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

$2 = a(5-4)^2 - 1$

$2 = a(1)^2 - 1$

$2 = a - 1$

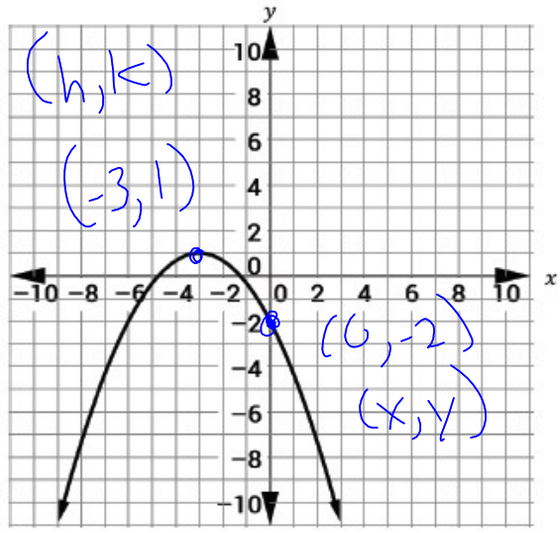
$a = 3$

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.

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

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

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

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

$-2 = 9a+1$

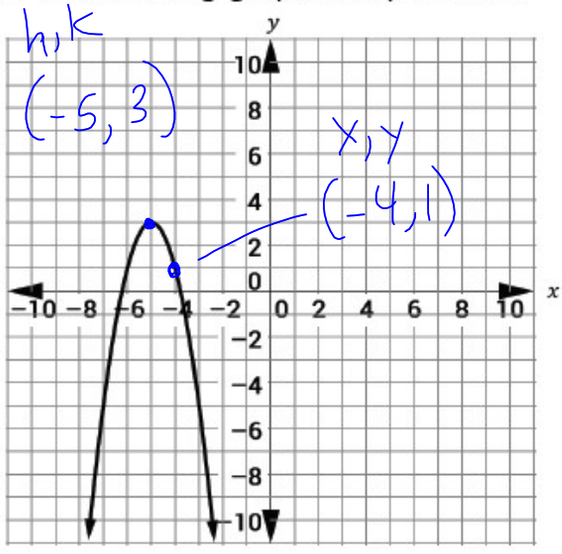
$-1 \quad -1$

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

$\frac{-3}{9} = a \qquad a = -\frac{1}{3}$

BEAT THE TEST!

1. Consider the following graph of a parabola.



h, k
(−5, 3)
x, y
(−4, 1)
$(x+5)^2$
$(x)^2$
$(x)(5)(2)$
$(5)^2$

$y = a(x-h)^2 + k$
$1 = a(-4+5)^2 + 3$
$1 = a(1)^2 + 3$
$1 = a + 3$
$-3 \quad -3$
$-2 = a$
$y = -2(x+5)^2 + 3$
$y = -2(x^2 + 10x + 25) + 3$
$y = -2x^2 - 20x - 50 + 3$

Which of the following functions is represented in the graph?

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