

Key

Section 4.7 Notes Day 2

Objectives: Write a quadratic equation given graph or given vertex and a point.

Warm-Up:

Identify if the parabola opens up/down, the vertex, axis of symmetry, max/min value of each equation.

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

$y = (x - 6)^2$

$y = -x^2 + 3$

Up/Down: Vertex: $(-4, 6)$

Up/Down: Vertex: $(6, 0)$

Up/Down: Vertex: $(0, 3)$

Axis of Symmetry: $x = -4$

Axis of Symmetry: $x = 6$

Axis of Symmetry: $x = 0$

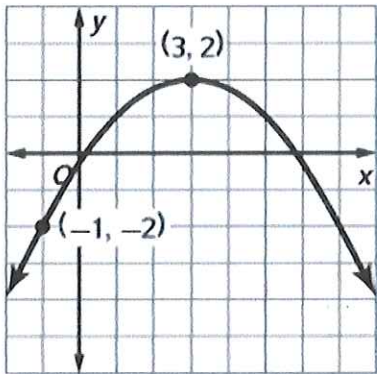
Max/Min Value: 6

Max/Min Value: 0

Max/Min Value: 3

If the vertex and one additional point on the graph of a parabola are known, you can write the equation of the parabola in vertex form.

Write the equation of the function shown in the graph:



$y = -\frac{1}{4}(x - 3)^2 + 2$

The vertex of the parabola is at $(3, 2)$, so $h = 3$

and $k = 2$. Since $(-1, -2)$ is a point on the

graph, let $x = -1$ and $y = -2$. Substitute these

values into the vertex form of the equation and solve for a.

$y = a(x - h)^2 + k \Rightarrow y = a(x - 3)^2 + 2$

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

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

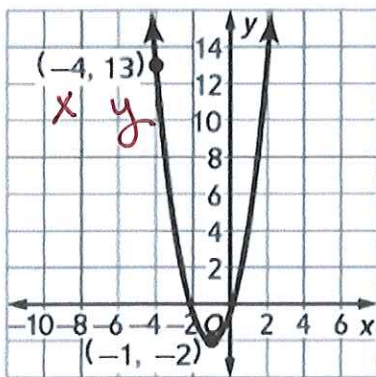
$-2 = 16a + 2$

$-2 = 16a + 2$

$\frac{-4}{16} = \frac{16a}{16}$

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

Write the equation of the function shown in the graphs:



1)

h, k

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

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

$13 = a(-4 + 1)^2 - 2$

$13 = a(-3)^2 - 2$

$13 = 9a - 2$

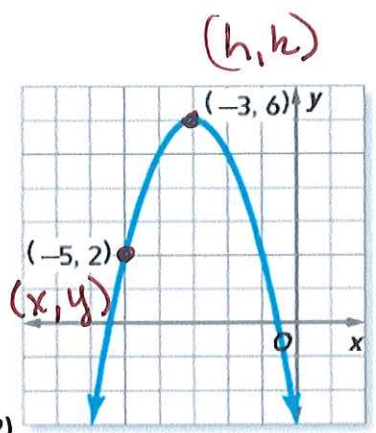
$15 = 9a$

$\frac{15}{9} = \frac{9a}{9}$

$a = \frac{5}{3}$

$y = \frac{5}{3}(x + 1)^2 - 2$

2)



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

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

$$2 = a(-5 + 3)^2 + b$$

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

$$2 = 4a + b$$

$$-4 = 4a$$

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

$$a = -1$$

$$y = -1(x + 3)^2 + b$$

The same work can be done when not given the graph, but still given the vertex and a point.

Write the equation of the function that has a vertex at (2, -5) and goes through the point (6, 8).

The vertex of the parabola is at (2, -5), so $h = 2$ and $k = -5$. Since (6, 8) is a point on the graph, let $x = 6$ and $y = 8$. Substitute these values into the vertex form of the equation and solve for a.

$$y = a(x - h)^2 + k \Rightarrow 8 = a(6 - 2)^2 - 5$$

$$8 = a(4)^2 - 5$$

$$8 = 16a - 5$$

$$16a = 13$$

$$a = \frac{13}{16}$$

$$y = \frac{13}{16}(x - 2)^2 - 5$$

3) Write the equation of the function that has a vertex at (6, 1) and goes through the point (7, 10).

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

$$10 = a(7 - 6)^2 + 1$$

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

$$9 = a$$

$$y = 9(x - 6)^2 + 1$$

4) Write the equation of the function that has a vertex at (3, 0) and goes through the point (6, -6).

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

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

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

$$9a = -6$$

$$a = \frac{-6}{9} = -\frac{2}{3}$$

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

5) Write the equation of the function that has a vertex at (0, 5) and goes through the point (3, 8).

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

$$8 = a(3 - 0)^2 + 5$$

$$8 = 9a + 5$$

$$3 = 9a$$

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

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

$$y = \frac{1}{3}(x - 0)^2 + 5$$

$$y = \frac{1}{3}x^2 + 5$$