

**Section 5 – Topic 3**

**Graphing Quadratic Functions in Vertex Form – Part 1**

The vertex form of a quadratic equation is  $f(x) = a(x - h)^2 + k$

Consider the following quadratic function.

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

Complete the table below for  $f(x)$ .

**Opening:** If  $a > 0$ , quadratic opens upward. If  $a < 0$ , quadratic opens downward.

upward

$(x, y)$

**Vertex:**  $(h, k)$

$(-2, -4)$

**Axis of Symmetry:** Use the  $x$ -coordinate of the vertex to find the axis of symmetry.

$x = -2$

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

$$+4 \qquad \qquad \qquad -4$$

$$\sqrt{4} = \sqrt{(x + 2)^2}$$

**x-intercepts:** Substitute 0 for  $y$  and solve for  $x$ .

$$\pm 2 = x + 2$$

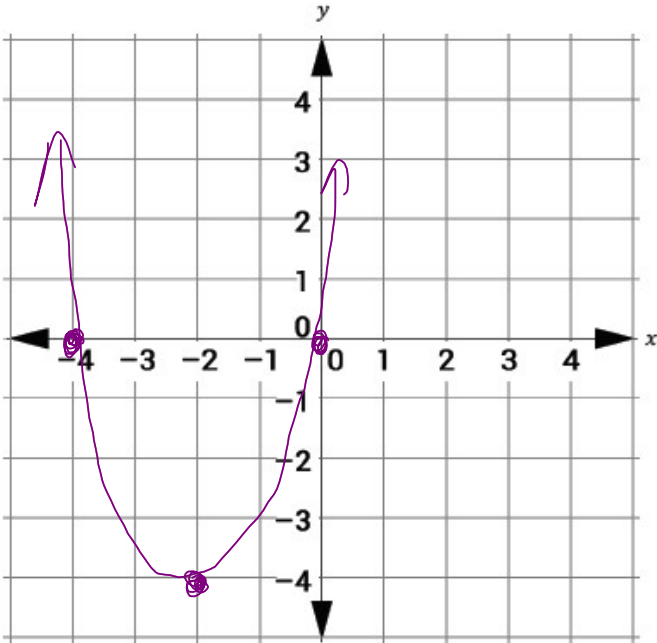
$$\begin{array}{l} 2 = x + 2 \quad -2 = x + 2 \\ -2 \quad -2 \quad -2 \quad -2 \\ 0 = x \quad -4 = x \end{array}$$

**y-intercept:** Substitute 0 for  $x$  and solve for  $y$ .

$$y = 0 \qquad y = (0 + 2)^2 - 4$$

$$y(2)^2 - 4 = 0$$

Sketch the graph of  $f(x)$ .



Try It!

1. Consider the following quadratic function.

$$f(x) = -(x - 1)^2 + 2$$

- a. Complete the table below for  $f(x)$ .

**Opening:** If  $a > 0$ , quadratic opens upward. If  $a < 0$ , quadratic opens downward.

downward

**Vertex:**  $(h, k)$

$(1, 2)$

**Axis of Symmetry:** Use the  $x$ -coordinate of the vertex to find the axis of symmetry.

$x = 1$

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

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

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

**x-intercepts:** Substitute 0 for  $y$  and solve for  $x$ .

$$\sqrt{2} = \sqrt{(x-1)^2} + 1$$

$$1.4 = x - 1$$

$$2.4 = x$$

$$\pm 1.4 = x - 1$$

$$-1.4 = x - 1$$

**y-intercept:** Substitute 0 for  $x$  and solve for  $y$ .

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

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

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

$$-1 + 2 = 1$$

$y = 1$

b. Sketch the graph of  $f(x)$ .

