Extension

Use after Lesson 10.5

Graph Quadratic Functions in Vertex Form

TEKS A.1.D, A.4.A; 2A.2.A, 2A.7.A

GOAL Graph quadratic functions in vertex form.

Key Vocabulary
- **vertex form**

In Lesson 10.2, you graphed quadratic functions in standard form. Quadratic functions can also be written in **vertex form**, $y = a(x - h)^2 + k$ where $a \neq 0$. In this form, the vertex of the graph can be easily determined.

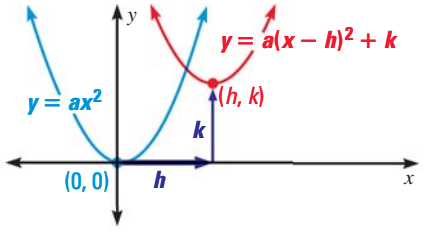
KEY CONCEPT *For Your Notebook*

Graph of Vertex Form $y = a(x - h)^2 + k$

The graph of $y = a(x - h)^2 + k$ is the graph of $y = ax^2$ translated h units horizontally and k units vertically.

Characteristics of the graph of $y = a(x - h)^2 + k$:

- The vertex is (h, k).
- The axis of symmetry is $x = h$.
- The graph opens up if $a > 0$, and the graph opens down if $a < 0$.



EXAMPLE 1 Graph a quadratic function in vertex form

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

Solution

STEP 1 **Identify** the values of a, h, and k: $a = -1$, $h = -2$, and $k = 3$. Because $a < 0$, the parabola opens down.

STEP 2 **Draw** the axis of symmetry, $x = -2$.

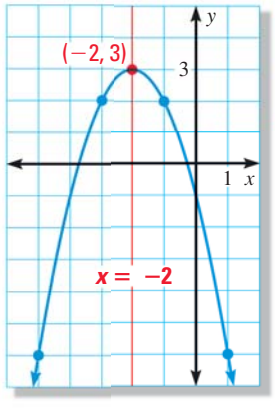
STEP 3 **Plot** the vertex $(h, k) = (-2, 3)$.

STEP 4 **Plot** four points. Evaluate the function for two x-values less than the x-coordinate of the vertex.

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

$x = -5$: $y = -(-5 + 2)^2 + 3 = -6$

Plot the points $(-3, 2)$ and $(-5, -6)$ and their reflections, $(-1, 2)$ and $(1, -6)$, in the axis of symmetry.



STEP 5 **Draw** a parabola through the plotted points.