4.2 Graph Quadratic Functions in Vertex or Intercept Form

TEKS 2A.4.B, 2A.7.A, 2A.7.B, 2A.8.A

Before You graphed quadratic functions in standard form.

Now You will graph quadratic functions in vertex form or intercept form.

Why? So you can find the height of a jump, as in Ex. 51.

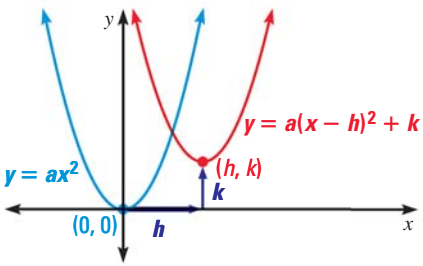
Key Vocabulary
- **vertex form**
- **intercept form**

In Lesson 4.1, you learned that the standard form of a quadratic function is $y = ax^2 + bx + c$ where $a \neq 0$. Another useful form of a quadratic function is the **vertex form**, $y = a(x - h)^2 + k$.

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 parabola $y = ax^2$ translated horizontally h units and vertically k units.



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 down if $a < 0$.

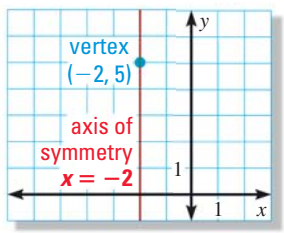
EXAMPLE 1 Graph a quadratic function in vertex form

Graph $y = -\frac{1}{4}(x + 2)^2 + 5$.

Solution

STEP 1 **Identify** the constants $a = -\frac{1}{4}$, $h = -2$, and $k = 5$. Because $a < 0$, the parabola opens down.

STEP 2 **Plot** the vertex $(h, k) = (-2, 5)$ and draw the axis of symmetry $x = -2$.

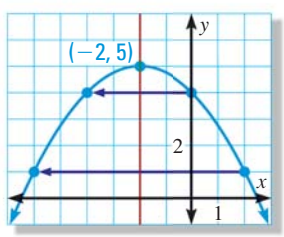


STEP 3 **Evaluate** the function for two values of x.

$x = 0$: $y = -\frac{1}{4}(0 + 2)^2 + 5 = 4$

$x = 2$: $y = -\frac{1}{4}(2 + 2)^2 + 5 = 1$

Plot the points $(0, 4)$ and $(2, 1)$ and their reflections in the axis of symmetry.



STEP 4 **Draw** a parabola through the plotted points.