

4.1 Graph Quadratic Functions in Standard Form

TEKS 2A.4.A, 2A.4.B, 2A.6.B, 2A.8.A



Before

You graphed linear functions.

Now

You will graph quadratic functions.

Why?

So you can model sports revenue, as in Example 5.

Key Vocabulary

- quadratic function
- parabola
- vertex
- axis of symmetry
- minimum value
- maximum value

A **quadratic function** is a function that can be written in the **standard form** $y = ax^2 + bx + c$ where $a \neq 0$. The graph of a quadratic function is a **parabola**.

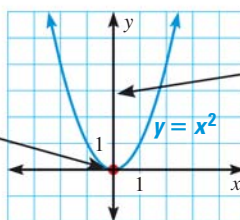
KEY CONCEPT

For Your Notebook

Parent Function for Quadratic Functions

The parent function for the family of all quadratic functions is $f(x) = x^2$. The graph of $f(x) = x^2$ is the parabola shown below.

The lowest or highest point on a parabola is the **vertex**. The vertex for $f(x) = x^2$ is **(0, 0)**.



The **axis of symmetry** divides the parabola into mirror images and passes through the vertex.

For $f(x) = x^2$, and for any quadratic function $g(x) = ax^2 + bx + c$ where $b = 0$, the vertex lies on the y -axis and the axis of symmetry is $x = 0$.

EXAMPLE 1 Graph a function of the form $y = ax^2$

Graph $y = 2x^2$. Compare the graph with the graph of $y = x^2$.

Solution

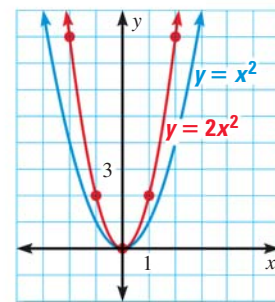
STEP 1 Make a table of values for $y = 2x^2$.

x	-2	-1	0	1	2
y	8	2	0	2	8

STEP 2 Plot the points from the table.

STEP 3 Draw a smooth curve through the points.

STEP 4 Compare the graphs of $y = 2x^2$ and $y = x^2$. Both open up and have the same vertex and axis of symmetry. The graph of $y = 2x^2$ is narrower than the graph of $y = x^2$.



SKETCH A GRAPH

Choose values of x on both sides of the axis of symmetry $x = 0$.