# 9-1   Reteaching

Quadratic Graphs and Their Properties

A U-shaped graph such as the one at the right is called a **parabola.**

- A parabola can open upward or downward.
- A parabola that opens upward has a minimum or lowest point.
- A parabola that opens downward has a maximum or highest point.
- The **vertex** of a parabola is its minimum or maximum point.

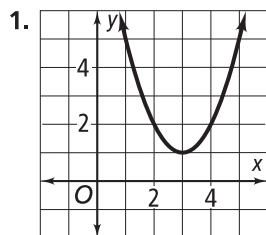All parabolas have a line or axis of symmetry.
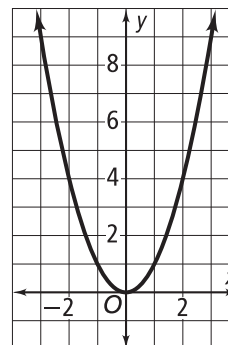
Problem

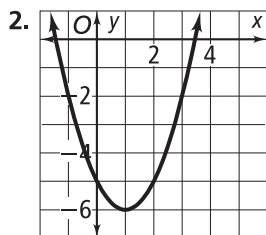**What is the vertex of the graph below? Is it a minimum or maximum?**
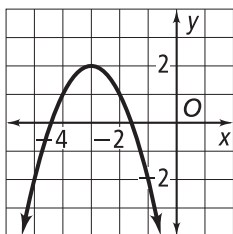
The graph opens downward, so you are looking for the highest point. The vertex is $(-3, 2)$ and it is a maximum.
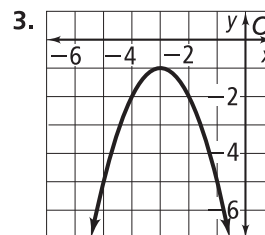
Exercises

Identify the vertex of each graph. Tell whether it is a minimum or a maximum.

1.

(3, 1); minimum

2.

(1, −6); minimum

3.

(−3, −1); maximum

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Reteaching (continued)

Quadratic Graphs and Their Properties

Any function in the form $y = ax^2 + bx + c$ where $a \neq 0$ is called a **quadratic function.** The graph of a quadratic function is a parabola.

Problem

What is the graph of $y = \frac{1}{2}x^2 - 4$?

This is a quadratic function where $a = \frac{1}{2}$, $b = 0$ and $c = -4$. The graph will be a parabola. Use a table to find some points on the graph. Then use what you know about parabolas to complete the graph.
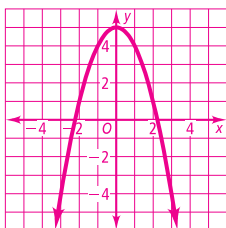
x	$y = \frac{1}{2}x^2 - 4$	(x, y)
-4	$y = \frac{1}{2}(-4)^2 - 4 = 4$	$(-4, 4)$
-2	$y = \frac{1}{2}(-2)^2 - 4 = -2$	$(-2, -2)$
0	$y = \frac{1}{2}(0)^2 - 4 = -4$	$(0, -4)$
2	$y = \frac{1}{2}(2)^2 - 4 = -2$	$(2, -2)$
4	$y = \frac{1}{2}(4)^2 - 4 = 4$	$(4, 4)$
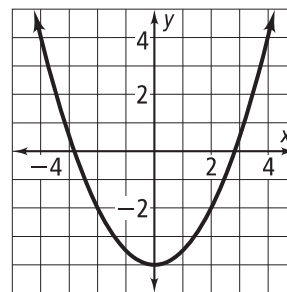
Exercises

Graph each function.

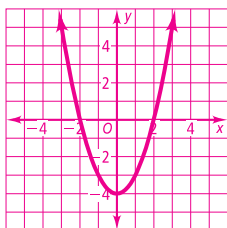**4.** $y = -x^2 + 5$

5. $y = x^2 - 4$

6. $y = -x^2 - 1$