

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Bellwork!**

1. What is the vertex of the function  $y = 3(x - 7)^2 + 4$ ?

(A)  $(-7, -4)$

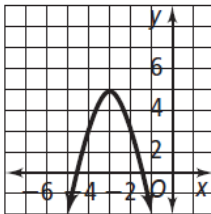
(B)  $(-7, 4)$

(C)  $(7, -4)$

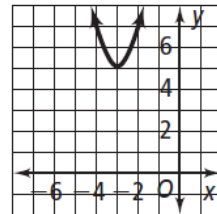
(D)  $(7, 4)$

2. Which is the graph of the function  $f(x) = -2(x + 3)^2 + 5$ ?

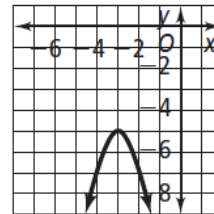
(F)



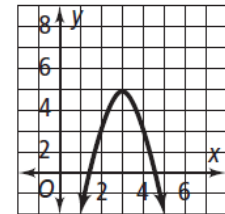
(G)



(H)



(I)



## AGENDA

**Bellwork:**

**Homework Review:**

**Lesson:** Standard Form of a Quadratic Function

**Objective:** To graph quadratic functions written in standard form.

**Essential Understanding** For any quadratic function  $f(x) = ax^2 + bx + c$ , the values of  $a$ ,  $b$ , and  $c$  provide key information about its graph.

**Problem 1** Finding the Features of a Quadratic Function

**Problem 2** Graphing a Function of the Form  $y = ax^2 + bx + c$

**Problem 3** Converting Standard Form to Vertex Form

**Problem 4** Interpreting a Quadratic Graph

**Teacher Directed:** Problems 1, 2, 3, 4

**Student Centered:** Lesson Quiz

**Homework:** Problem Set G “select problems”

## 4-2

## Standard Form of a Quadratic Function

In Lesson 4-1, you worked with quadratic functions written in vertex form. Now you will use quadratic functions in *standard form*. The **standard form** of a quadratic function is  $f(x) = ax^2 + bx + c$ , where  $a \neq 0$ .

**Essential Understanding** For any quadratic function  $f(x) = ax^2 + bx + c$ , the values of  $a$ ,  $b$ , and  $c$  provide key information about its graph.

You can find information about the graph of a quadratic function (such as the vertex) easily from the vertex form. Such information is “hidden” in standard form. However, standard form is easier to enter into a graphing calculator.



### Problem 1 Finding the Features of a Quadratic Function

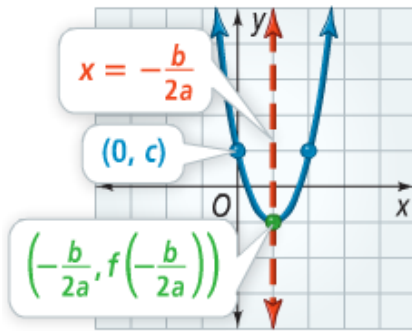
**Graphing Calculator** What are the vertex, the axis of symmetry, the maximum or minimum value, and the range of  $y = 2x^2 + 8x - 2$ ?

**Got It?** 1. What are the vertex, axis of symmetry, maximum or minimum value, and range of  $y = -3x^2 - 4x + 6$ ?

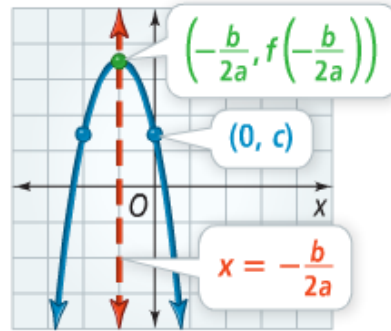
### Properties Quadratic Function in Standard Form

- The graph of  $f(x) = ax^2 + bx + c$ ,  $a \neq 0$ , is a parabola.
- If  $a > 0$ , the parabola opens upward. If  $a < 0$ , the parabola opens downward.
- The axis of symmetry is the line  $x = -\frac{b}{2a}$ .
- The  $x$ -coordinate of the vertex is  $-\frac{b}{2a}$ . The  $y$ -coordinate of the vertex is the  $y$ -value of the function for  $x = -\frac{b}{2a}$ , or  $y = f\left(-\frac{b}{2a}\right)$ .
- The  $y$ -intercept is  $(0, c)$ .

$$y = ax^2 + bx + c, a > 0$$

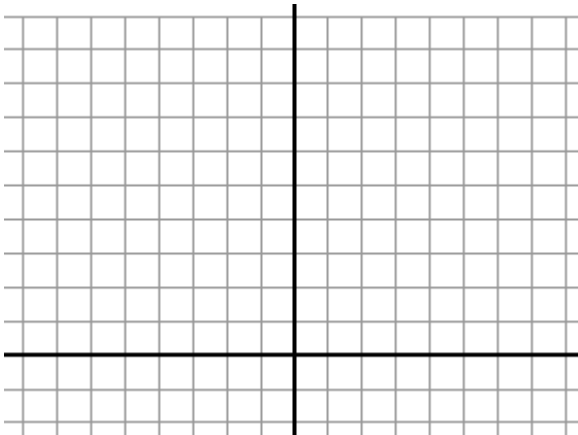


$$y = ax^2 + bx + c, a < 0$$

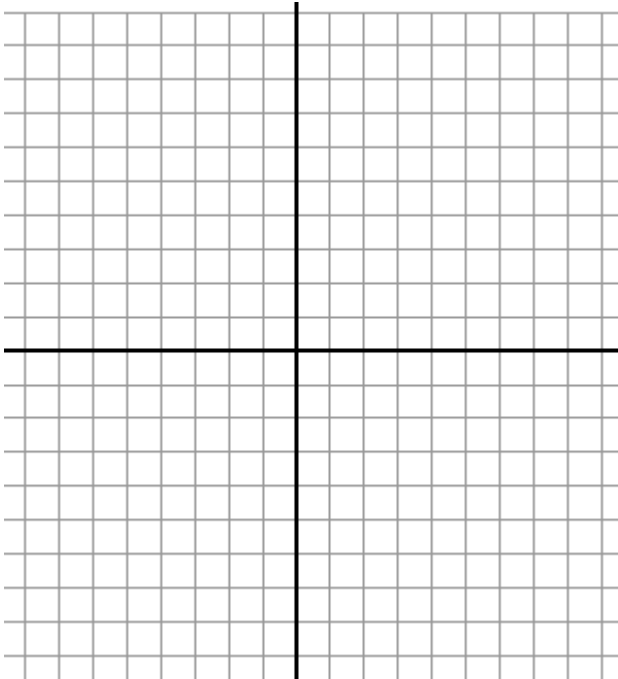


## Problem 2 Graphing a Function of the Form $y = ax^2 + bx + c$

What is the graph of  $y = x^2 + 2x + 3$ ?



**Got It?** 2. What is the graph of  $y = -2x^2 + 2x - 5$ ?



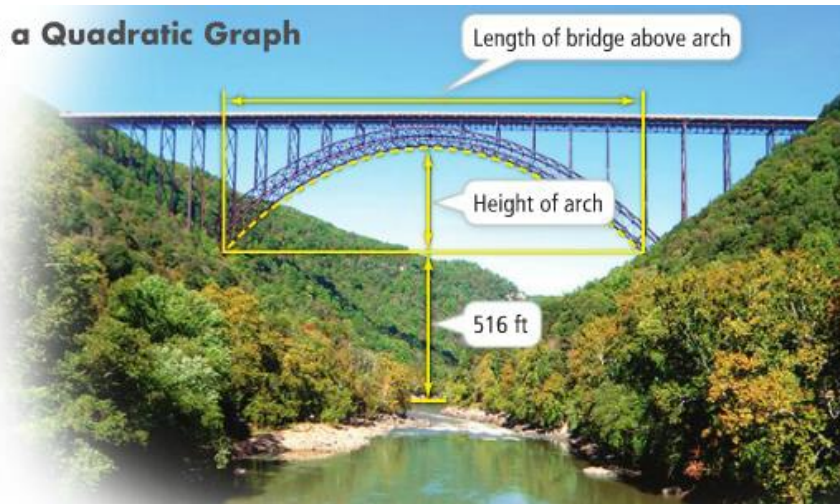
### Problem 3 Converting Standard Form to Vertex Form

What is the vertex form of  $y = 2x^2 + 10x + 7$ ?

**Got It?** 3. What is the vertex form of  $y = -x^2 + 4x - 5$ ?

### Problem 4 Interpreting a Quadratic Graph

**Bridges** The New River Gorge Bridge in West Virginia is the world's largest steel single arch bridge. You can model the arch with the function  $y = -0.000498x^2 + 0.847x$ , where  $x$  and  $y$  are in feet. How high above the river is the arch? How long is the section of bridge above the arch?



Name: \_\_\_\_\_

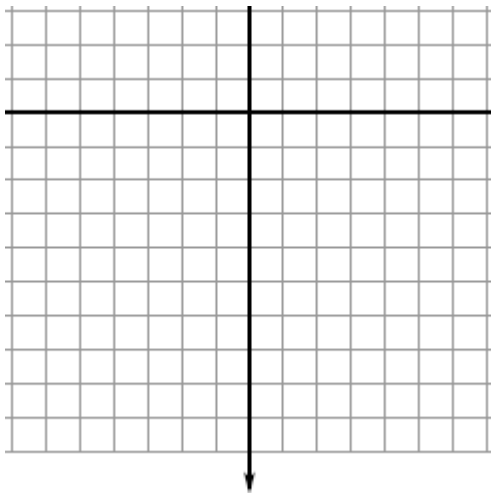
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## 4-2 Lesson Quiz

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1. What are the vertex, axis of symmetry, maximum or minimum value, and range of  $y = 3x^2 + 6x - 1$ ?

2. What is the graph of  $y = x^2 + 8x + 4$ ?



3. Write  $y = -5x^2 + x + 1$  in vertex form.

4. **Do you UNDERSTAND?** A parabolic arch sculpture is on top of a city bank. A model of the arch is  $y = -0.005x^2 + 0.3x$  where  $x$  and  $y$  are in feet.

a. What is the distance from the highest point of the arch to the ground?



b. What is the width of the bank building?