

### 8.1 Graphing $f(x) = ax^2$ (pp. 419–424)

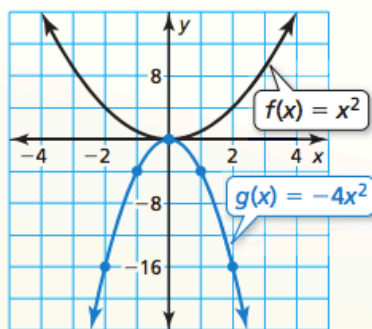
Graph  $g(x) = -4x^2$ . Compare the graph to the graph of  $f(x) = x^2$ .

**Step 1** Make a table of values.

$x$	-2	-1	0	1	2
$g(x)$	-16	-4	0	-4	-16

**Step 2** Plot the ordered pairs.

**Step 3** Draw a smooth curve through the points.

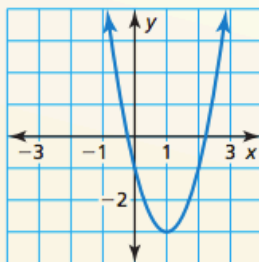


▶ The graphs have the same vertex,  $(0, 0)$ , and the same axis of symmetry,  $x = 0$ , but the graph of  $g$  opens down and is narrower than the graph of  $f$ . So, the graph of  $g$  is a vertical stretch by a factor of 4 and a reflection in the  $x$ -axis of the graph of  $f$ .

**Graph the function. Compare the graph to the graph of  $f(x) = x^2$ .**

1.  $p(x) = 7x^2$       2.  $q(x) = \frac{1}{2}x^2$       3.  $g(x) = -\frac{3}{4}x^2$       4.  $h(x) = -6x^2$

5. Identify characteristics of the quadratic function and its graph.



### 8.2 Graphing $f(x) = ax^2 + c$ (pp. 425–430)

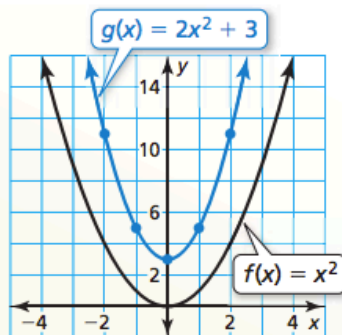
Graph  $g(x) = 2x^2 + 3$ . Compare the graph to the graph of  $f(x) = x^2$ .

**Step 1** Make a table of values.

$x$	-2	-1	0	1	2
$g(x)$	11	5	3	5	11

**Step 2** Plot the ordered pairs.

**Step 3** Draw a smooth curve through the points.



▶ Both graphs open up and have the same axis of symmetry,  $x = 0$ . The graph of  $g$  is narrower, and its vertex,  $(0, 3)$ , is above the vertex of the graph of  $f$ ,  $(0, 0)$ . So, the graph of  $g$  is a vertical stretch by a factor of 2 and a vertical translation 3 units up of the graph of  $f$ .

**Graph the function. Compare the graph to the graph of  $f(x) = x^2$ .**

6.  $g(x) = x^2 + 5$       7.  $h(x) = -x^2 - 4$       8.  $m(x) = -2x^2 + 6$       9.  $n(x) = \frac{1}{3}x^2 - 5$

### 8.3 Graphing $f(x) = ax^2 + bx + c$ (pp. 431–438)

Graph  $f(x) = 4x^2 + 8x - 1$ . Describe the domain and range.

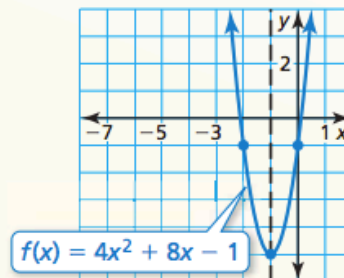
**Step 1** Find and graph the axis of symmetry:  $x = -\frac{b}{2a} = -\frac{8}{2(4)} = -1$ .

**Step 2** Find and plot the vertex. The axis of symmetry is  $x = -1$ . So, the  $x$ -coordinate of the vertex is  $-1$ . The  $y$ -coordinate of the vertex is  $f(-1) = 4(-1)^2 + 8(-1) - 1 = -5$ . So, the vertex is  $(-1, -5)$ .

**Step 3** Use the  $y$ -intercept to find two more points on the graph. Because  $c = -1$ , the  $y$ -intercept is  $-1$ . So,  $(0, -1)$  lies on the graph. Because the axis of symmetry is  $x = -1$ , the point  $(-2, -1)$  also lies on the graph.

**Step 4** Draw a smooth curve through the points.

▶ The domain is all real numbers. The range is  $y \geq -5$ .



**Graph the function. Describe the domain and range.**

10.  $y = x^2 - 2x + 7$

11.  $f(x) = -3x^2 + 3x - 4$

12.  $y = \frac{1}{2}x^2 - 6x + 10$

13. The function  $f(t) = -16t^2 + 88t + 12$  represents the height (in feet) of a pumpkin  $t$  seconds after it is launched from a catapult. When does the pumpkin reach its maximum height? What is the maximum height of the pumpkin?

Also, study page 440 in your textbook.