

**LESSON**  
**19-2** **Transforming Quadratic Functions**  
**Reteach**

A parabola has the equation  $f(x) = a(x - h)^2 + k$ . Identify:

- a.  $a$ , a stretch if  $a > 1$  or compression if  $0 < a < 1$
- b.  $h$ , the horizontal translation
- c.  $k$ , the vertical translation

The vertex is  $(h, k)$  and the parabola opens up if  $a > 0$  and opens down if  $a < 0$ .

In parabola  $f(x) = 4(x - 3)^2 + 5$ , the stretch is 4, the horizontal translation is 3 to the right, and the vertical translation is up 5. The vertex is  $(3, 5)$ , and the parabola opens up.

**Complete 1–4 for parabola  $f(x) = 2(x + 7)^2 + 9$ .**

- 1. Stretch or shrink? \_\_\_\_\_
- 2. Open up or down? \_\_\_\_\_
- 3. Horizontal translation? \_\_\_\_\_
- 4. Vertical translation? \_\_\_\_\_

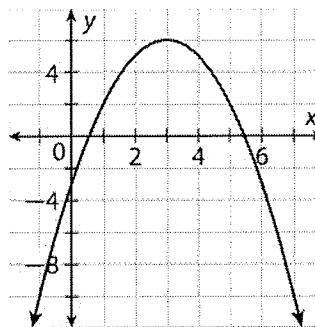
**Complete 5–8 for parabola  $f(x) = \frac{1}{2}(x - 4)^2 - 8$ .**

- 5. Stretch or shrink? \_\_\_\_\_
- 6. Open up or down? \_\_\_\_\_
- 7. Horizontal translation? \_\_\_\_\_
- 8. Vertical translation? \_\_\_\_\_

For a parabola that opens up, the vertex represents the minimum point. For a parabola that opens down, the vertex represents the maximum point.

**The following graph is a translation of  $y = x^2$ .**

- 9. The vertex is (\_\_\_\_\_, \_\_\_\_\_).
- 10. Is the vertex a maximum or a minimum?  
\_\_\_\_\_
- 11. The quadratic equation for the graph is  
\_\_\_\_\_.



**LESSON** **Transforming Quadratic Functions**

**19-2** *Practice and Problem Solving: A/B*

A parabola has the equation  $f(x) = 2(x - 3)^2 - 4$ . Complete:

- The vertex is \_\_\_\_\_.
- The graph opens \_\_\_\_\_.
- The function has a minimum value of \_\_\_\_\_.

The following graph is a translation of  $y = x^2$ . Use it for 4–6.

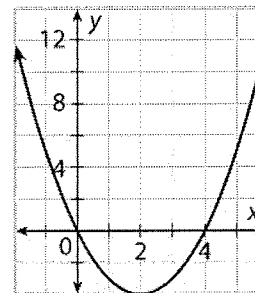
- What is the horizontal translation?

\_\_\_\_\_

- What is the vertical translation?

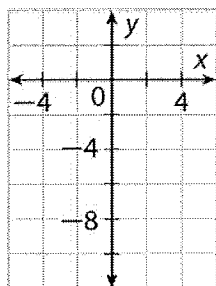
\_\_\_\_\_

- What is the quadratic equation for the graph? \_\_\_\_\_

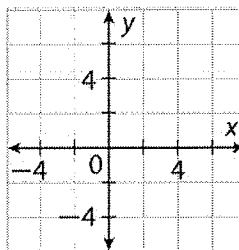


Graph the following parabolas.

7.  $y = -2(x + 1)^2 + 2$

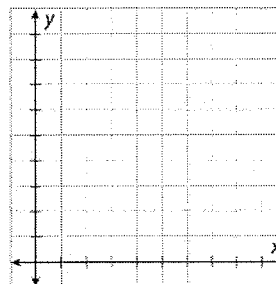


8.  $y = \frac{1}{2}(x - 2)^2 - 3$



A ball follows a parabolic path represented by  $f(x) = -2(x - 5)^2 + 9$ . Use this equation for 9–12.

- What is the vertex? \_\_\_\_\_
- What is the axis of symmetry? \_\_\_\_\_
- Find two points on either side of the axis.  
\_\_\_\_\_ and \_\_\_\_\_
- Graph the parabola.



### LESSON 19-1 Reteach

- down
- highest
- wider
- $x = 0$
- down
- $(0, 0)$

### LESSON 19-2 Reteach

- stretch
- up
- left 7
- up 9
- shrink
- up
- right 4
- down 8
- $(3, 6)$
- maximum
- $y = -(x - 3)^2 + 6$

### LESSON 19-3 Reteach

- Vertex  $(5, 2)$ , axis of symmetry  $x = 5$
- Vertex  $(-3, -1)$ , axis of symmetry  $x = -3$
- Vertex  $(-4, 1)$ , axis of symmetry  $x = -4$
- Vertex  $(3, 6)$ , axis of symmetry  $x = 3$
- Vertex  $(9, 5)$ , axis of symmetry  $x = 9$
- Vertex  $(-2, -15)$ , axis of symmetry  $x = -2$

### LESSON 20-1 Reteach

1.

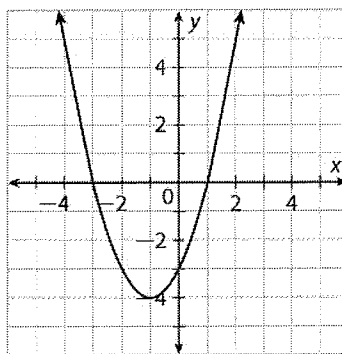
<b>x</b>	0	1	2	3	4
<b>y</b>	-5	-8	-9	-8	-5

- $x = -1$  and  $x = 5$
- 0

4.

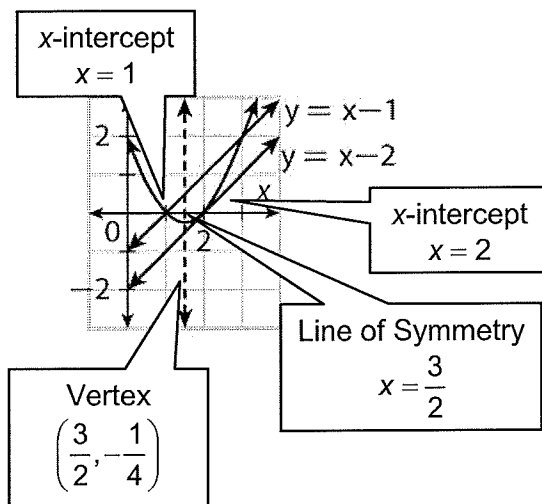
<b>x</b>	-3	-2	-1	0	1
<b>y</b>	0	-3	-4	-3	0

- $x = -3$  and  $x = 1$



### LESSON 20-2 Reteach

$$y = x^2 - 3x + 2$$



### LESSON 20-3 Reteach

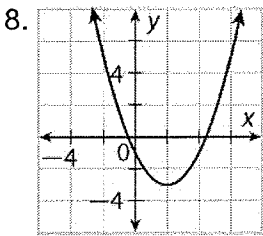
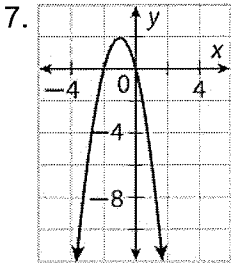
- $x = 6, x = 3$
- $x = -8, x = 5$
- $y = 7, y = 3$
- $x = -6, x = 3$
- $x = -4, x = -3$
- $t = -9, t = 3$
- $n = 5, n = -3$
- $a = 10, a = -3$
- $z = 6, z = -4$
- $x = -4, x = 2$
- $g = -3, g = 3$

3. The graph of  $g(x)$  is a parabola that opens downward and has the same width as the graph of  $f(x) = x^2$ . Possible explanation: The expression  $-x^2$  is equivalent to  $-1x^2$ , and so the value of  $a$  is  $-1$ . Since the value of  $a$  is negative, the graph is the reflection of  $f(x) = x^2$  when it is reflected across the  $x$ -axis. That is the reason the graph of  $g(x)$  opens downward. For every  $x$ , the value of  $g(x)$  is the opposite of the value of  $f(x)$ . That is the reason the graph of  $g(x)$  has the same width as the graph of  $f(x)$ .

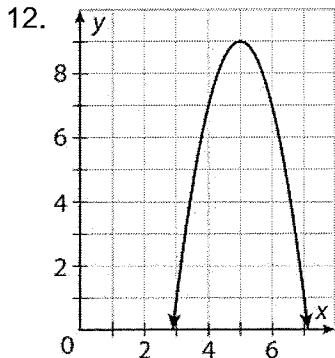
### LESSON 19-2

#### Practice and Problem Solving: A/B

1.  $(3, -4)$
2. up
3.  $-4$
4. 2
5.  $-4$
6.  $y = (x - 2)^2 - 4$

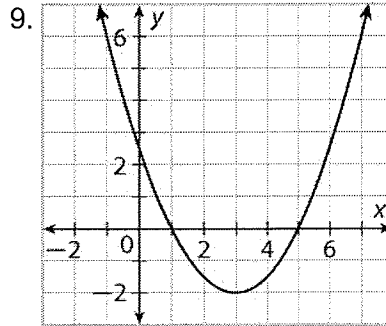
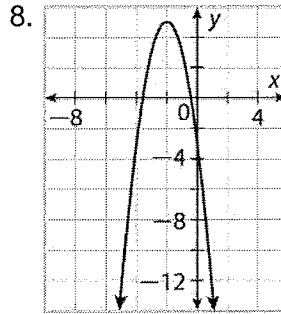


9.  $(5, 9)$
10.  $x = 5$
11.  $(4, 7)$  and  $(6, 7)$

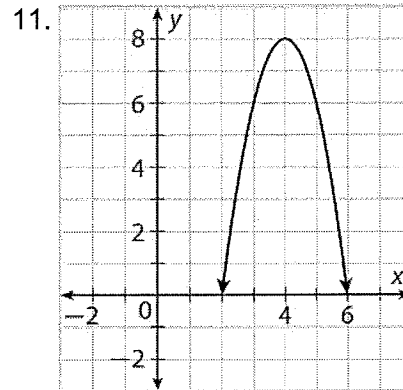


#### Practice and Problem Solving: C

1.  $(3, 4)$
2. down
3. 4
4.  $-3$
5. 2
6. positive
7.  $y = (x + 3)^2 + 2$



10.  $(4, 8)$



12. At  $x = 2$  and  $x = 6$  the ball is at  $y = 0$  or ground level.

#### Practice and Problem Solving: Modified

1. 3 to the right
2. down 4
3.  $(3, -4)$