

## 9.3

## Graphs of Quadratic Equations

$$y = -2x^2 - 8x + 0$$

y-int:  $(0,0)$   
 $y = -2(0)^2 - 8(0)$   
 $= 0 - 0 = 0$

x-int:  $(0,0)$  &  $(-4,0)$   
 $0 = -2x^2 - 8x$

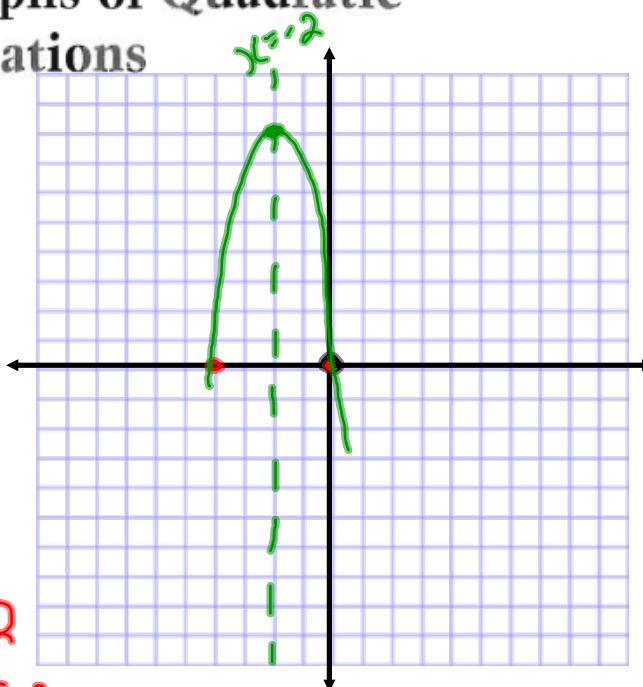
$\Rightarrow 0 = x^2 + 4x$   
 $+ (2)^2 \quad + (2)^2$   
 $4 = (x+2)^2$   
 $\pm 2 = x+2$   
 $x = -2 \pm 2$

line of symmetry:  
 $x = -2$

vertex:  
 $y = -2(-2)^2 - 8(-2)$   
 $= -8 + 16 = 8$

shaping points:

pick a point to the right of vertex and one to the left of the vertex to shape out parabola



$$y = x^2 + 6x + 2$$

y-intercept:

$$\begin{aligned} &(\text{when } x=0) \\ y &= (0)^2 + 6(0) + 2 \\ &= 2 \quad (0, 2) \end{aligned}$$

x-intercepts:

$$\begin{aligned} &(\text{when } y=0) \\ 0 &= x^2 + 6x + 2 \\ x &= \frac{-6 \pm \sqrt{36 - 4(1)(2)}}{2(1)} \\ &= \frac{-6 \pm \sqrt{36 - 8}}{2} \\ &= \frac{-6 \pm \sqrt{28}}{2} \end{aligned}$$

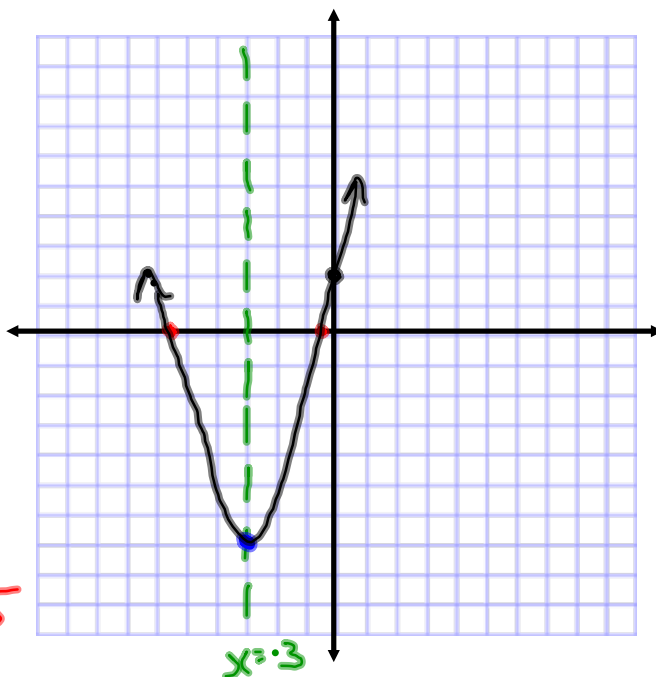
$$\begin{aligned} \frac{-6 + \sqrt{28}}{2} &\approx -0.35 \\ \frac{-6 - \sqrt{28}}{2} &\approx -5.65 \end{aligned}$$

line of symmetry:

$$x = \frac{-b}{2a} = \frac{-6}{2} = -3$$

vertex:

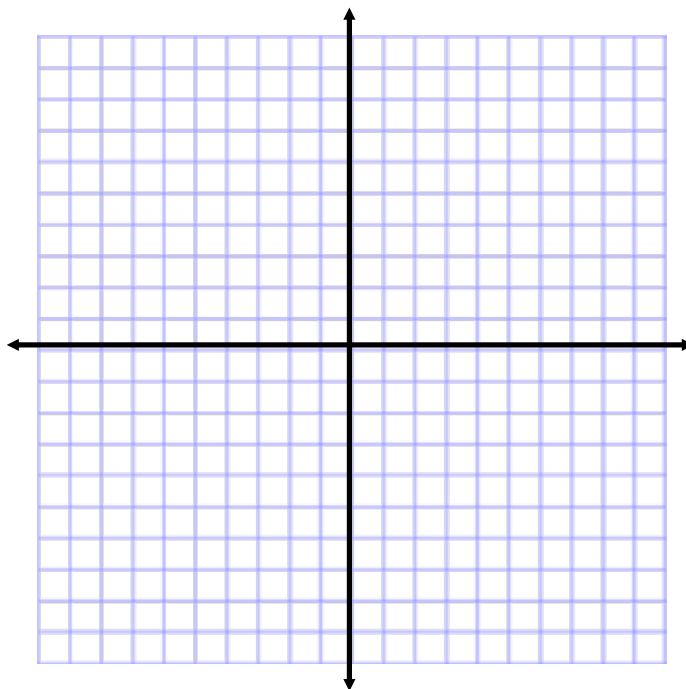
$$\begin{aligned} y &= (-3)^2 + 6(-3) + 2 \\ &= 9 - 18 + 2 \\ &= -9 + 2 = -7 \\ &(-3, -7) \end{aligned}$$



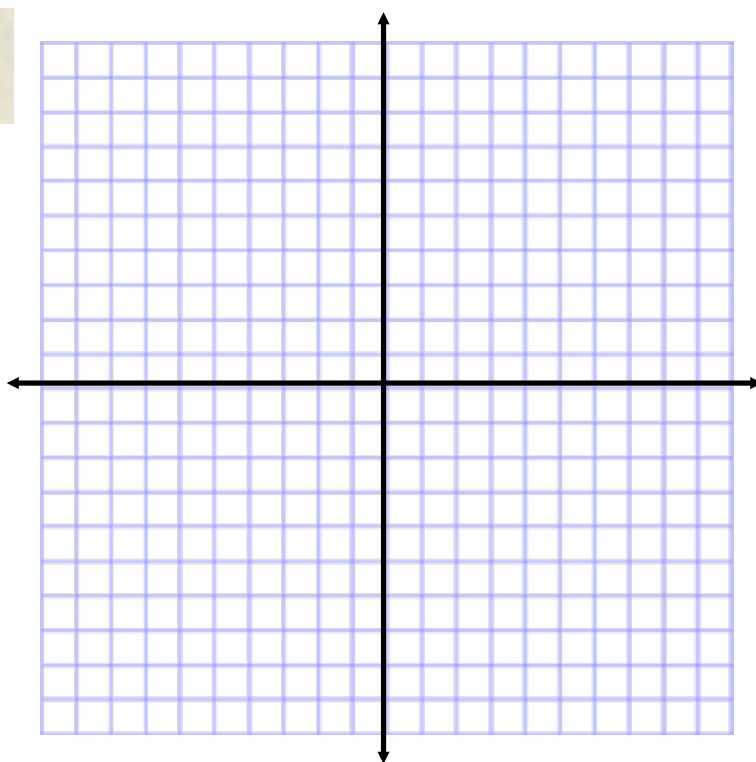
shaping points:

pick a point to the right of vertex and one to the left of the vertex to shape out parabola

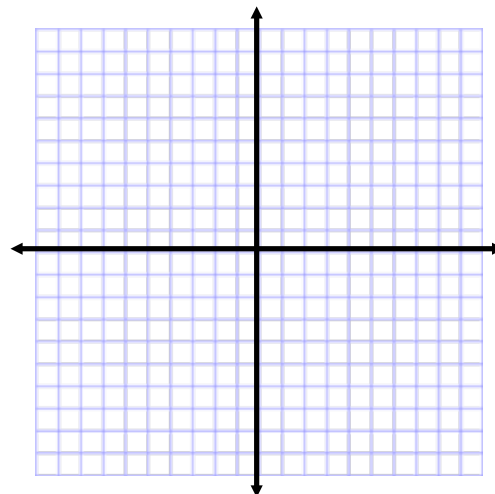
13.  $y = -x^2 - 4$



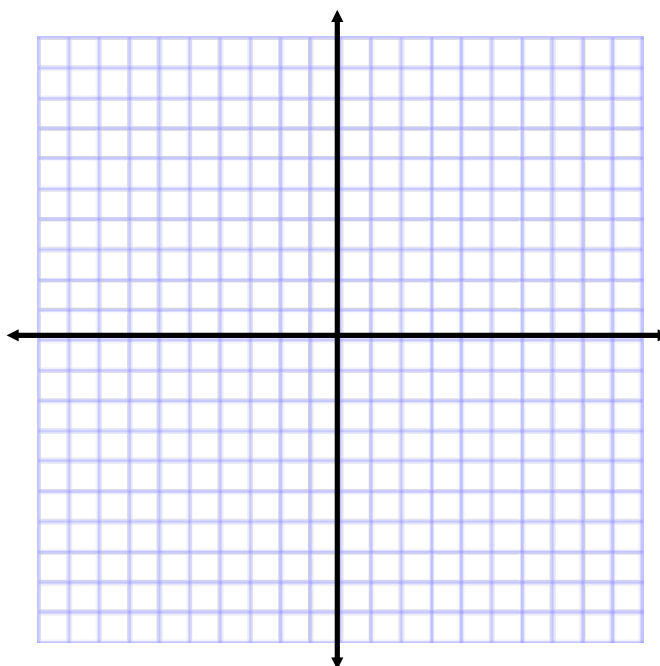
14.  $y = x^2 + 6x + 5$

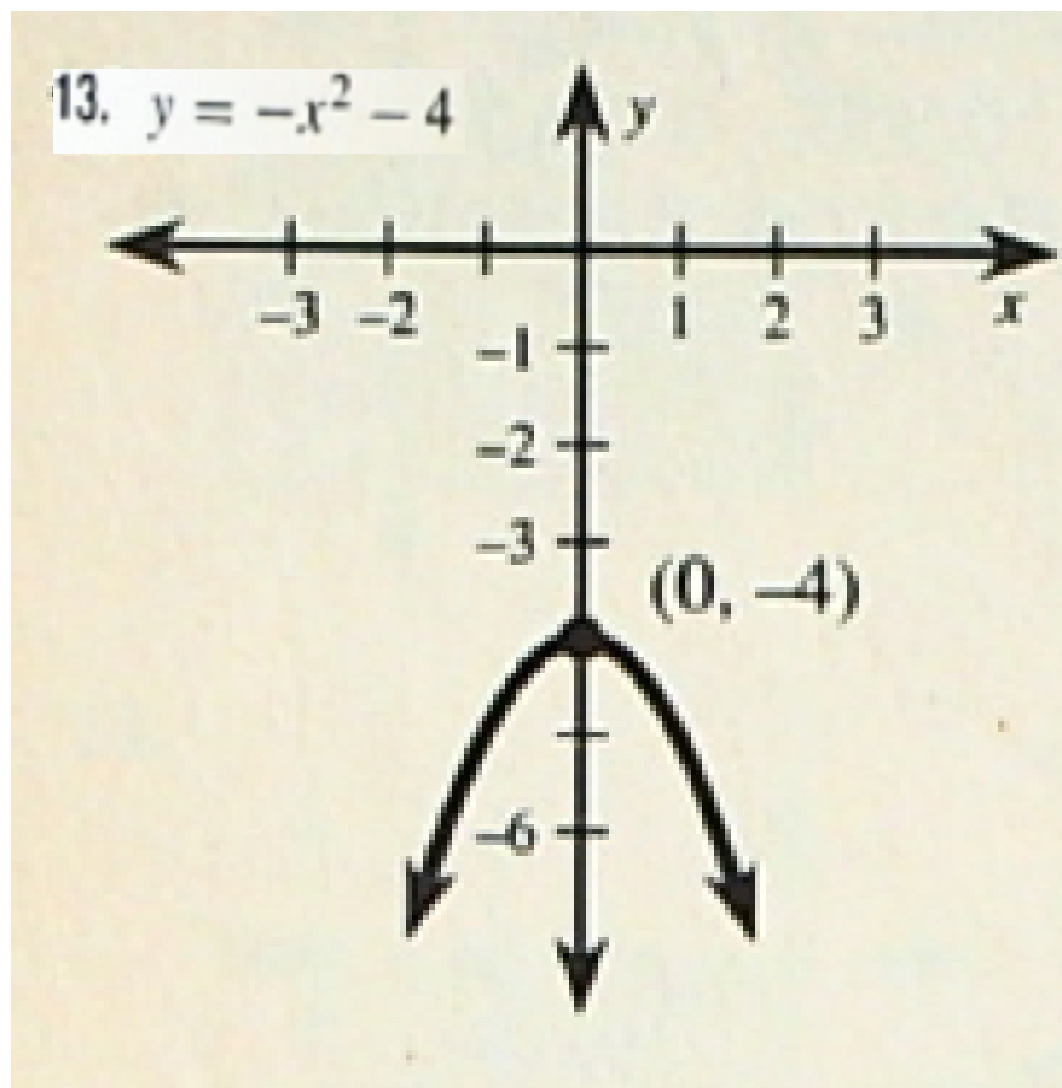


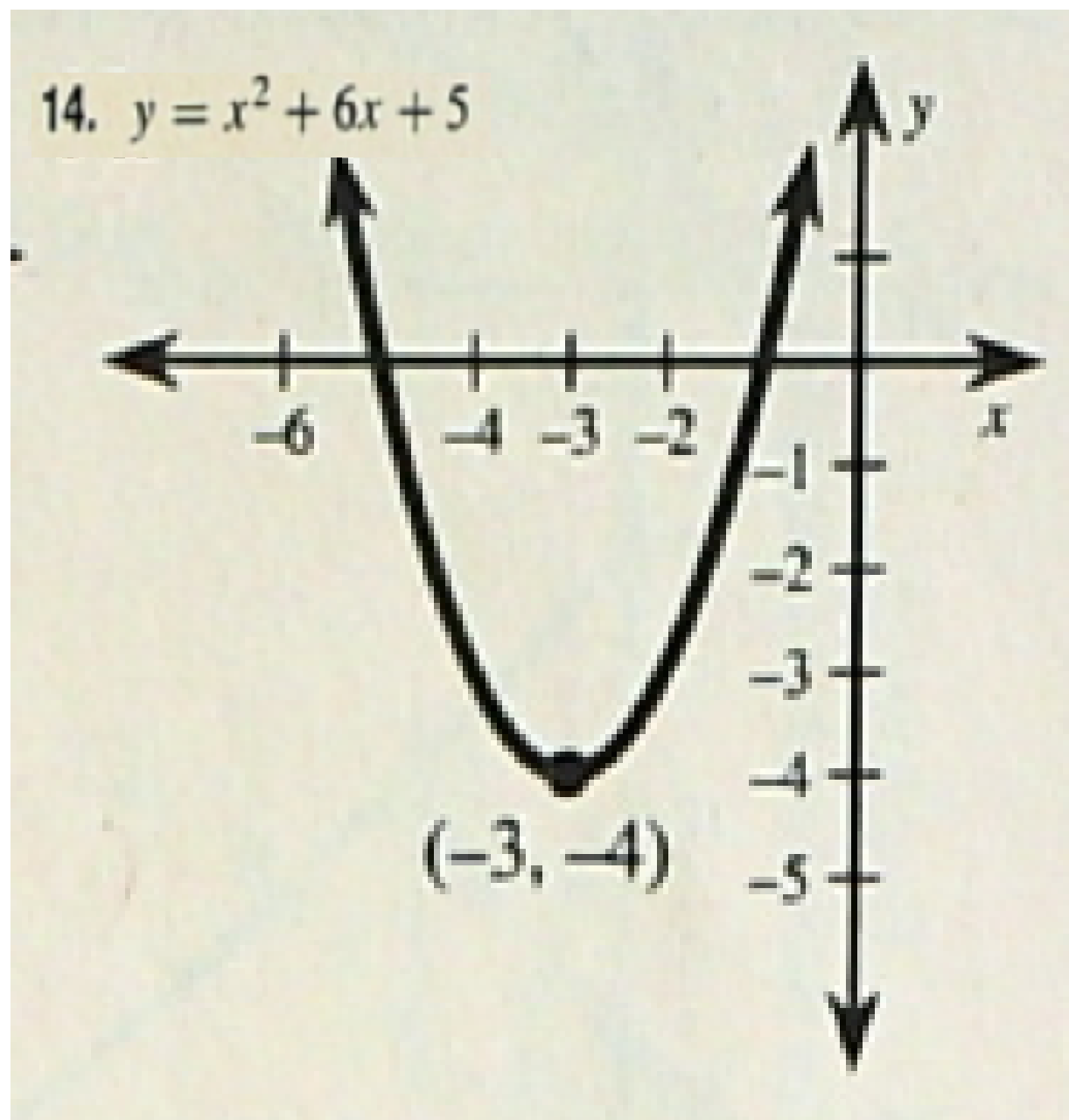
15.  $y = -x^2 - 4x - 3$



16.  $y = x^2 + 2x - 15$

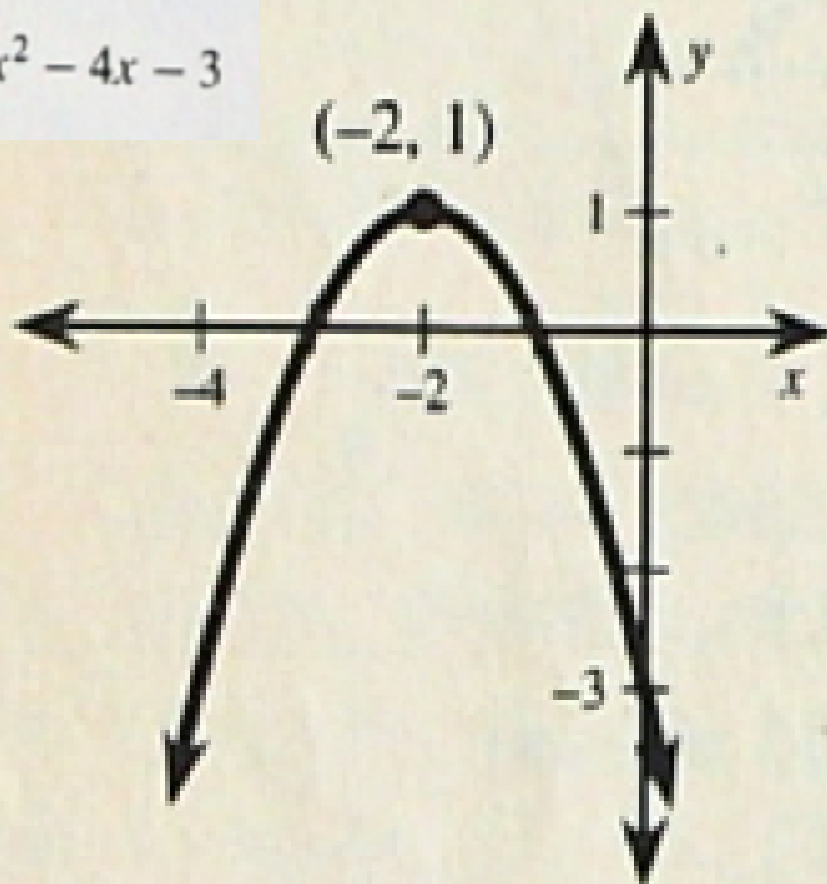




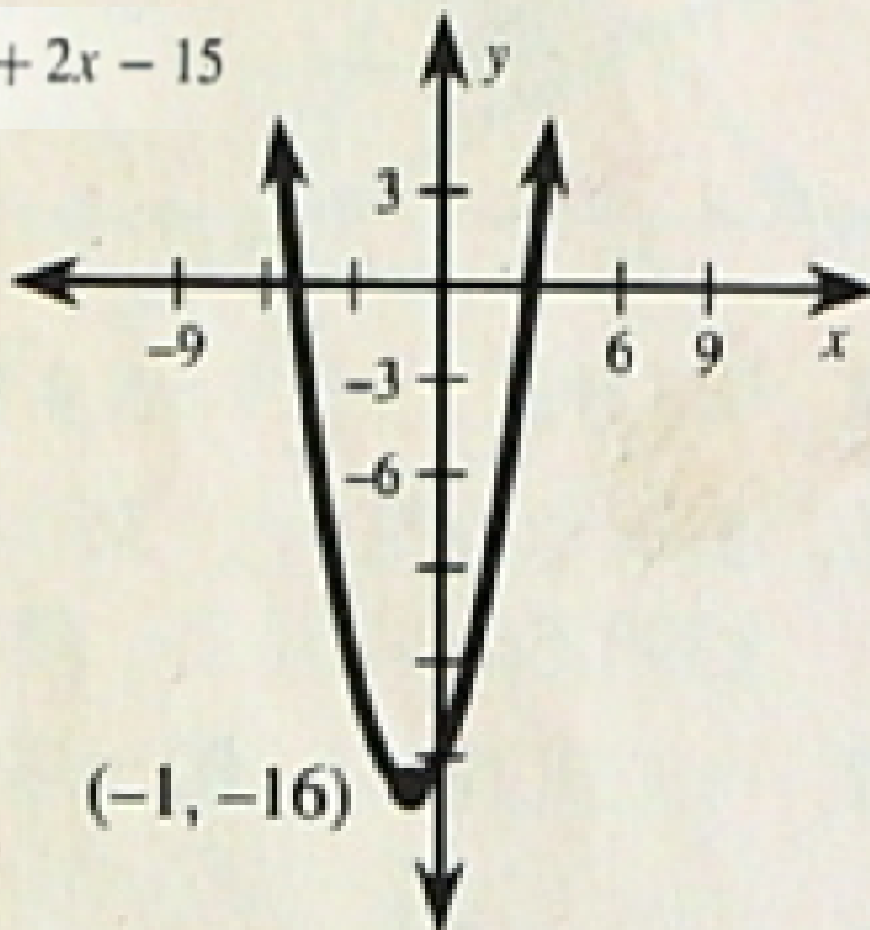




15.  $y = -x^2 - 4x - 3$



16.  $y = x^2 + 2x - 15$



**Extra Practice****9.3**

Name \_\_\_\_\_

In 1–12, decide whether the graph of the equation opens up or down. Then find the coordinates of the vertex.

1.  $y = 3x^2$

2.  $y + 2x^2 = 0$

3.  $y = 5x^2 - 1$

4.  $y = x^2 + 6x$

5.  $y - 8 = -3x^2$

6.  $y = -2x^2 - 8x$

7.  $y = x^2 + 6x + 2$

8.  $y = 2x^2 - 4x + 3$

9.  $y = 3x^2 - 12x - 2$

10.  $y = -2x^2 + 4x - 1$

11.  $y - x^2 = 2x + 4$

12.  $y + 3 = -x^2 + 4x$

In 13–24, sketch the graph of the equation. Label the vertex.

13.  $y = -x^2 - 4$

14.  $y = x^2 + 6x + 5$

15.  $y = -x^2 - 4x - 3$

16.  $y = x^2 + 2x - 15$

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

18.  $y = x^2 - 6x + 10$

19.  $y = -2x^2 - 8x + 20$

20.  $y = 2x^2 - 6x + 4$

21.  $y = -x^2 + 2x + 5$

