

See ANSWERS below on page 2.

Write each equation in vertex form. Then, state the vertex and axis of symmetry.

1. $y = -x^2 - 6x - 3$

2. $y = x^2 + 6x + 13$

3. $y = 3x^2 + 12x + 18$

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

Write the equation in vertex form, given the criteria below.

5. vertex (8, -9) passes through (7, -10)

6. vertex (0, 3) passes through (-1, 2)

7. vertex (-10, -8) passes through (-7, -17)

Answers:

$$\left(\frac{6}{2}\right)^2 = 9$$

1. $y = -(x+3)^2 + 6, (-3, 6), x = -3$

$$\begin{aligned} y &= -x^2 - 6x - 3 \\ +3 & \quad +3 \\ -1(9) + 3 &= -(x^2 + 6x + 9) \\ -6 &= -(x + \frac{6}{2})^2 \\ -6 &= -(x+3)^2 \\ +6 & \quad +6 \end{aligned}$$

$$y = -(x+3)^2 + 6$$

Vertex $(-3, 6)$
AOS: $x = -3$

$$\left(\frac{6}{2}\right)^2 = 9$$

2. $y = (x+3)^2 + 4, (-3, 4), x = -3$

$$\begin{aligned} y &= x^2 + 6x + 13 \\ -13 & \quad -13 \\ 9 + -13 &= x^2 + 6x + 9 \\ -4 &= (x + \frac{6}{2})^2 \\ -4 &= (x+3)^2 \\ +4 & \quad +4 \end{aligned}$$

$$y = (x+3)^2 + 4$$

Vertex $(-3, 4)$
AOS: $x = -3$

$$\left(\frac{4}{2}\right)^2 = 4$$

3. $y = 3(x+2)^2 + 6, (-2, 6), x = -2$

$$\begin{aligned} y &= 3x^2 + 12x + 18 \\ -18 & \quad -18 \\ 3(4) + -18 &= 3(x^2 + 4x + 4) \\ -6 &= 3(x + \frac{4}{2})^2 \\ -6 &= 3(x+2)^2 \\ +6 & \quad +6 \end{aligned}$$

$$y = 3(x+2)^2 + 6$$

Vertex $(-2, 6)$
AOS: $x = -2$

$$\left(\frac{-2}{2}\right)^2 = 1$$

4. $y = -2(x-1)^2 - 2, (1, -2), x = 1$

$$\begin{aligned} y &= -2x^2 + 4x - 4 \\ +4 & \quad +4 \\ -2(1) + 4 &= -2(x^2 - 2x + 1) \\ 2 &= -2(x - \frac{2}{2})^2 \\ 2 &= -2(x-1)^2 \\ -2 & \quad -2 \end{aligned}$$

$$y = -2(x-1)^2 - 2$$

Vertex $(1, -2)$
AOS: $x = 1$

5. $y = -(x-8)^2 - 9$

Vertex $(8, -9)$ pt: $(7, -10)$

$$\begin{aligned} y &= a(x-8)^2 - 9 \\ -10 &= a(7-8)^2 - 9 \\ -10 &= a - 9 \\ +9 & \quad +9 \\ -1 &= a \end{aligned}$$

$$y = -(x-8)^2 - 9$$

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

vertex $(0, 3)$ pt: $(-1, 2)$

$$y = a(x - 0)^2 + 3$$

$$2 = a(-1)^2 + 3$$

$$\underset{-3}{2} = \underset{-3}{a} + 3$$

$$-1 = a$$

$$\boxed{y = -x^2 + 3}$$

7. $y = -(x + 10)^2 - 8$

vertex $(-10, -8)$ pt: $(-7, -17)$

$$y = a(x + 10)^2 - 8$$

$$-17 = a(-7 + 10)^2 - 8$$

$$-17 = 9a - 8$$

$$\begin{array}{cc} +8 & +8 \end{array}$$

$$\frac{-9}{9} = \frac{99}{9}$$

$$-1 = a$$

$$\boxed{y = -(x + 10)^2 - 8}$$