

## Algebra 2

### Chapter 4 - Chapter Review Solutions

4.  $f(x) = 4(x+2)^2 - 6$

The vertex is  $(h, k) = (-2, -6)$ .

The axis of symmetry is  $x = h$ , or  $x = -2$ .

Since  $a > 0$ , the parabola opens upward.  $k = -6$  is the minimum value. Minimum is the vertex  $(-2, -6)$ .

Domain: All real numbers. There is no restriction on the value of  $x$ .

Range:  $y \geq -6$ , since the minimum value of the function is  $-6$ .

6.  $f(x) = 10(x-1)^2 + 5$

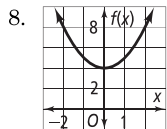
The vertex is  $(h, k) = (1, 5)$ .

The axis of symmetry is  $x = h$ , or  $x = 1$ .

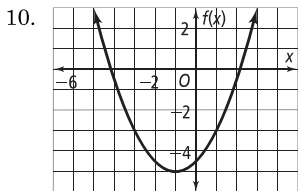
Since  $a > 0$ , the parabola opens upward.  $k = 5$  is the minimum value. Minimum is the vertex  $(1, 5)$ .

Domain: All real numbers. There is no restriction on the value of  $x$ .

Range:  $y \geq 5$ , since the minimum value of the function is 5.



The graph of  $f(x) = x^2 + 4$  is a translation of the graph of  $f(x) = x^2$  4 units up.



The graph of  $f(x) = \frac{1}{2}(x+1)^2 - 5$  is a vertical compression of the graph of  $f(x) = x^2$  by a factor of  $\frac{1}{2}$ , and a translation 1 unit to the left and 5 units down.

12. The vertex is  $(-5, 4)$ .

$h = -5, k = 4$

Substitute in the vertex form. Solve for  $a$ .

$$y = a(x-h)^2 + k$$

$$1 = a(-2 - (-5))^2 + 4$$

$$1 = 9a + 4$$

$$-3 = 9a$$

$$a = -\frac{1}{3}$$

$$y = \left(-\frac{1}{3}\right)(x+5)^2 + 4$$

17.  $f(x) = 4x^2 - 8x + 2$

$a = 4$  and  $b = -8$

Find the  $x$ -coordinate of the vertex.

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

$$x = -\frac{-8}{2(4)}$$

$$x = 1$$

Substitute  $x = 1$  into the equation.

$$f(x) = 4(1)^2 - 8(1) + 2$$

$$= 4 - 8 + 2$$

$$= -2$$

The vertex is  $(1, -2)$ .

Write the vertex form and substitute.

$$f(x) = a(x-h)^2 + k$$

$$f(x) = 4(x-1)^2 - 2$$

19.  $f(x) = 8x^2 + 8x - 12$

$a = 8$  and  $b = 8$

Find the  $x$ -coordinate of the vertex.

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

$$x = -\frac{8}{2(8)}$$

$$x = -\frac{1}{2}$$

Substitute  $x = -\frac{1}{2}$  into the equation.

$$f(x) = 8\left(-\frac{1}{2}\right)^2 + 8\left(-\frac{1}{2}\right) - 12$$

$$= 2 - 4 - 12$$

$$= -14$$

The vertex is  $\left(-\frac{1}{2}, -14\right)$ .

Write the vertex form and substitute.

$$f(x) = a(x-h)^2 + k$$

$$f(x) = 8\left(x - \left(-\frac{1}{2}\right)\right)^2 - 14$$

$$f(x) = 8\left(x + \frac{1}{2}\right)^2 - 14$$

21. Find the vertex.

$$t = -\frac{b}{2a}$$

$$t = -\frac{32}{2(-16)}$$

$$t = 1$$

Substitute  $t = 1$  into the equation.

$$h = -16(1)^2 + 32(1) + 9$$

$$= -16 + 32 + 9$$

$$= 25$$

It will reach maximum height after 1 second. The maximum height is 25 feet.

23. Use (2, 0):

$$a \cdot 2^2 + b \cdot 2 + c = 0$$

$$4a + 2b + c = 0$$

Use (3, -2):

$$a \cdot 3^2 + b \cdot 3 + c = -2$$

$$9a + 3b + c = -2$$

Use (1, -2):

$$a \cdot (1)^2 + b \cdot (1) + c = -2$$

$$a + b + c = -2$$

Use the matrix  $\begin{bmatrix} 4 & 2 & 1 & 0 \\ 9 & 3 & 1 & -2 \\ 1 & 1 & 1 & -2 \end{bmatrix}$

$$\text{rref} \begin{bmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & 8 \\ 0 & 0 & 1 & -8 \end{bmatrix}$$

$$(a, b, c) = (-2, 8, -8)$$

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

25. Use (0, -7):

$$a \cdot 0^2 + b \cdot 0 + c = -7$$

$$c = -7$$

Use (7, -14):

$$a \cdot 7^2 + b \cdot 7 + c = -14$$

$$49a + 7b + c = -14$$

Use (-3, -19):

$$a \cdot (-3)^2 + b \cdot (-3) + c = -19$$

$$9a - 3b + c = -19$$

Use the matrix  $\begin{bmatrix} 0 & 0 & 1 & -7 \\ 49 & 7 & 1 & -14 \\ 9 & -3 & 1 & -19 \end{bmatrix}$

$$\text{rref} \begin{bmatrix} 1 & 0 & 0 & -0.5 \\ 0 & 1 & 0 & 2.5 \\ 0 & 0 & 1 & -7 \end{bmatrix}$$

$$(a, b, c) = (-0.5, 2.5, -7)$$

$$y = -0.5x^2 + 2.5x - 7$$

26. Enter data and use QuadReg:  $y = -0.0043x^2 + 0.3521x + 0.3691$

27.  $x^2 - 8x + 12$

Find factors with product 12 and sum  $-8$ .

Since  $c > 0$ , both factors have the same sign.

Since  $b < 0$ , both factors must be negative.

Factors:  $-6$  and  $-2$

$$(x - 6)(x - 2)$$

31.  $x^2 - 14x + 49 = (x)^2 - 2(x)(7) + 7^2$   
 $= (x - 7)^2$

33.  $36x^2 - 16 = (6x)^2 - 4^2$   
 $= (6x - 4)(6x + 4)$   
 $= 2(3x - 2)2(3x + 2)$   
 $= 4(3x - 2)(3x + 2)$

36.  $-14x^2 - 49$

$$\text{GCF} = 7$$

$$7(-2x^2) - 7(7) = 7(-2x^2 - 7)$$
  
$$= -7(2x^2 + 7)$$

37.  $x^2 = 4x + 12$

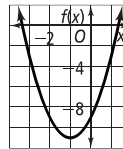
$$x^2 - 4x - 12 = 0$$

$$(x + 2)(x - 6) = 0$$

$$x = -2 \text{ or } x = 6$$

42.  $9 - 4x = 2x^2$

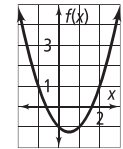
$$\text{Use } y = 2x^2 + 4x - 9.$$



The solutions are 1.345 and  $-3.345$ .

43.  $x^2 - x = 1$

$$\text{Use } y = x^2 - x - 1.$$



The solutions are 1.618 and  $-0.618$ .

46.  $9x - 14 = 3x^2$

$$\text{Use } y = 3x^2 - 9x + 14.$$

There are no real solutions.