

I can graph quadratic functions of the form  $f(x) = a(x - h)^2$

In Exercises 1-3, find the vertex and the axis of symmetry of the graph of the function.

1.  $f(x) = 4(x + 2)^2$

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

3.  $y = -5(x + 7)^2$

Vertex:  $(-2, 0)$

Vertex:  $(3, 0)$

Vertex:  $(-7, 0)$

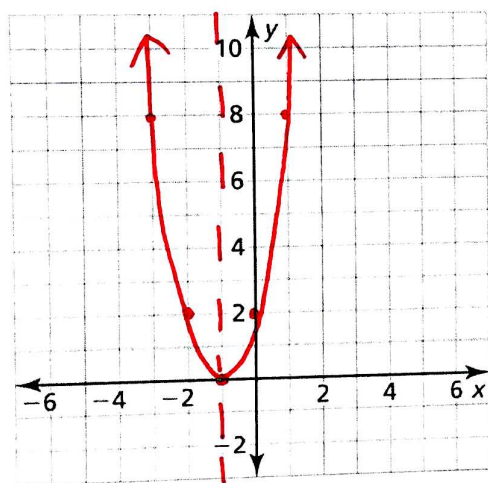
AOS:  $X = -2$

AOS:  $X = 3$

AOS:  $X = -7$

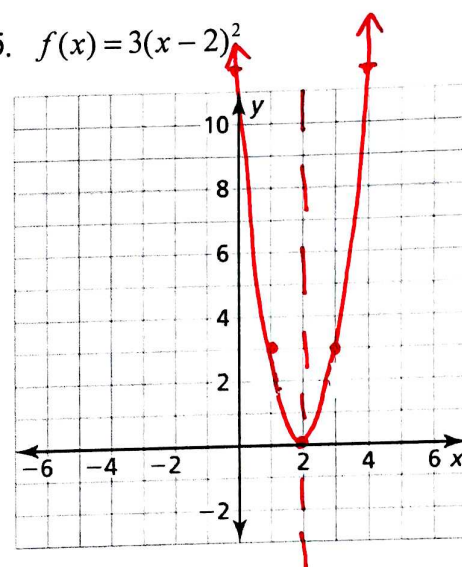
In Exercises 4-6, graph the function. Compare the graph to the graph of  $f(x) = x^2$ .

4.  $g(x) = 2(x + 1)^2$



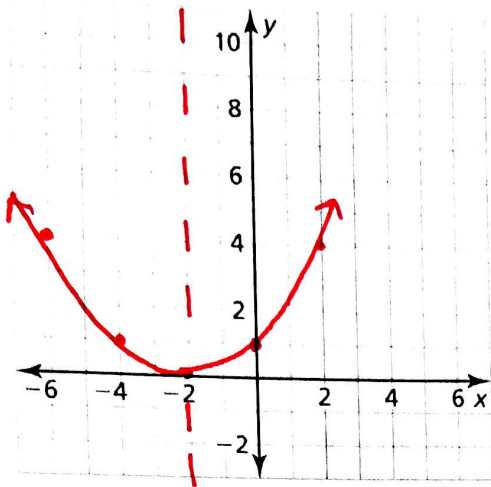
Comparison: vertical stretch (narrower)  
shifted left 1 unit

5.  $f(x) = 3(x - 2)^2$



Comparison: vertical stretch (narrower)  
shifted right 2 units

6.  $g(x) = \frac{1}{4}(x+2)^2$



Comparison: vertical compression (wider)  
shifted left 2 units

I can graph quadratic functions of the form  $f(x) = a(x - h)^2 + k$

In Exercises 7-9, find the vertex and the axis of symmetry of the graph of the function.

7.  $y = -5(x+3)^2 - 2$

8.  $f(x) = 2(x-2)^2 + 5$

9.  $y = -3(x+5)^2 - 4$

Vertex:  $(-3, -2)$

Vertex:  $(2, 5)$

Vertex:  $(-5, -4)$

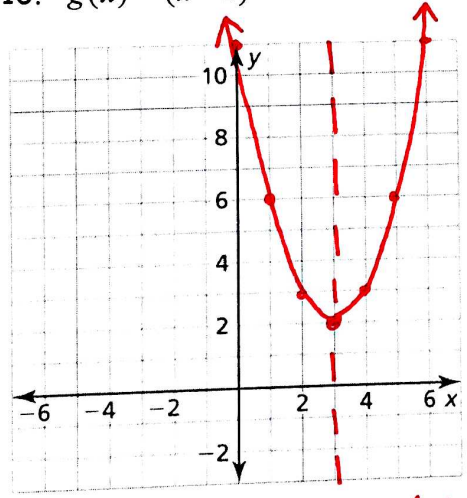
AOS:  $x = -3$

AOS:  $x = 2$

AOS:  $x = -5$

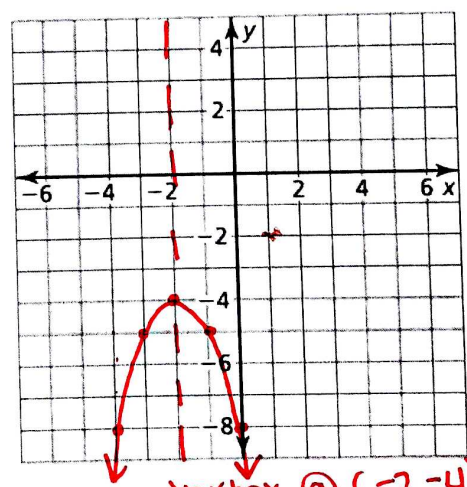
In Exercises 10-11, graph the function. Compare the graph to the graph of  $f(x) = x^2$ .

10.  $g(x) = (x-3)^2 + 2$



Comparison: vertex @  $(3, 2)$   
Right 3 units; Up 2 units

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

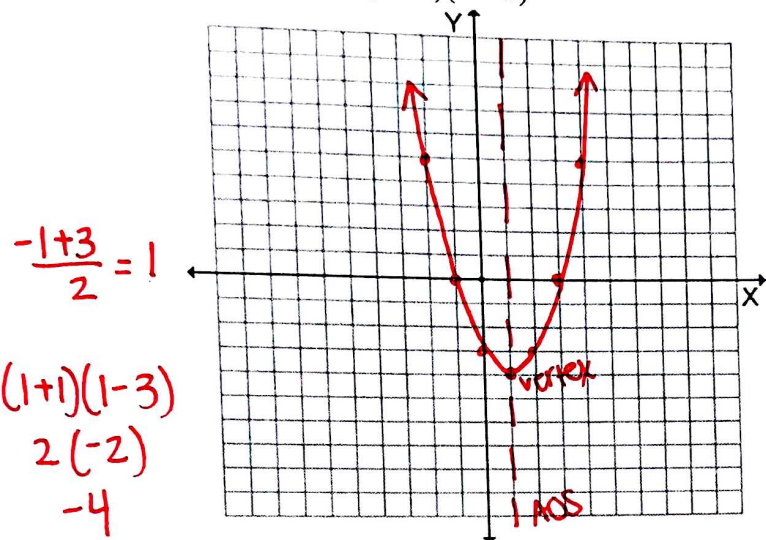


Comparison: vertex @  $(-2, -4)$   
Reflected over the x-axis

I can graph quadratic functions of the form  $f(x) = a(x - p)(x - q)$

In Exercises 12-15, graph the quadratic function. Label the vertex, axis of symmetry, and the x-intercepts. Describe the domain and range of the function.

12.  $f(x) = (x+1)(x-3)$

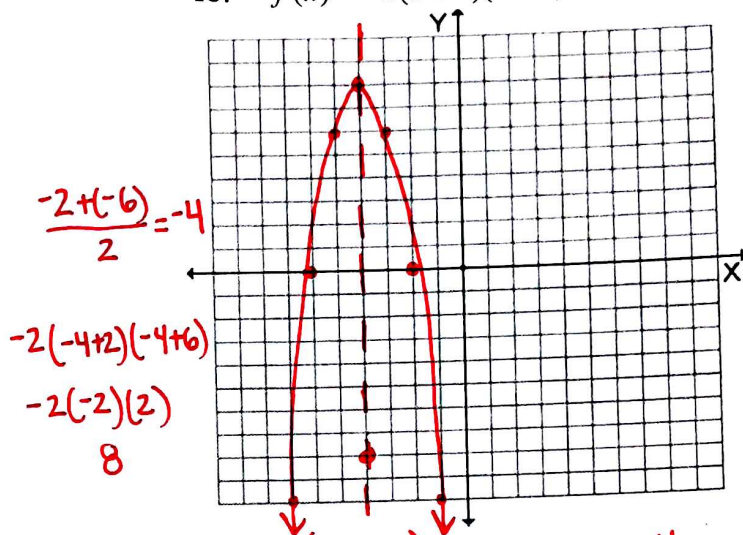


Vertex:  $(1, -4)$  AOS:  $x=1$

x-intercepts:  $(-1, 0)$   $(3, 0)$

D:  $\mathbb{R}$  R:  $f(x) \geq -4$

13.  $f(x) = -2(x+2)(x+6)$

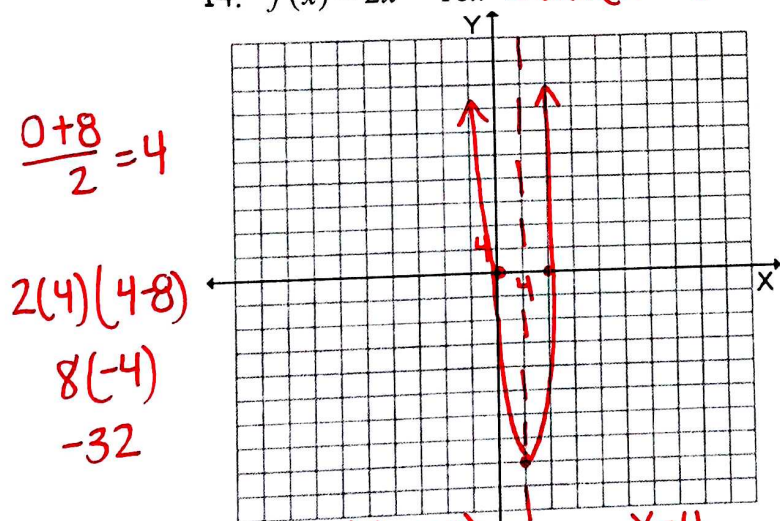


Vertex:  $(-4, 8)$  AOS:  $x=-4$

x-intercepts:  $(-2, 0)$   $(-6, 0)$

D:  $\mathbb{R}$  R:  $f(x) \leq 8$

14.  $f(x) = 2x^2 - 16x = 2x(x-8)$

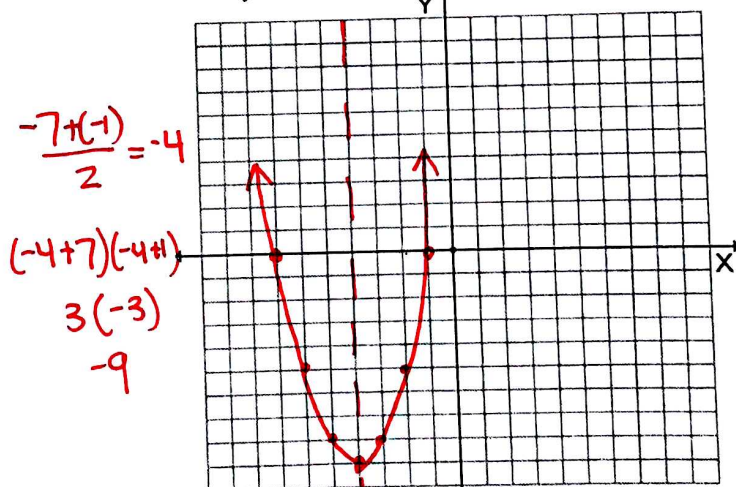


Vertex:  $(4, -32)$  AOS:  $x=4$

x-intercepts:  $(0, 0)$   $(8, 0)$

D:  $\mathbb{R}$  R:  $f(x) \geq -32$

15.  $y = x^2 + 8x + 7 = (x+7)(x+1)$



Vertex:  $(-4, -9)$  AOS:  $x=-4$

x-intercepts:  $(-7, 0)$   $(-1, 0)$

D:  $\mathbb{R}$  R:  $y \geq -9$

I can use intercept form to find the zeros of functions

In Exercises 16-19, find the zero(s) of the function.

16.  $y = -4(x-5)(x-9)$

$$x-5=0 \quad x-9=0$$

$$x=5 \quad x=9$$

Zeros:  $x=5, x=9$

17.  $f(x) = \frac{1}{4}(x+3)(x-2)$

$$x+3=0 \quad x-2=0$$

$$\begin{array}{cc} -3 & -3 \\ x & = -3 \end{array} \quad \begin{array}{cc} +2 & +2 \\ x & = 2 \end{array}$$

Zeros:  $x=-3, x=2$

18.  $g(x) = x^2 - 7x - 30$

$$g(x) = (x-10)(x+3)$$

$$x-10=0 \quad x+3=0$$

$$\begin{array}{cc} +10 & +10 \\ x & = 10 \end{array} \quad \begin{array}{cc} -3 & -3 \\ x & = -3 \end{array}$$

$$x=10 \quad x=-3$$

Zeros:  $x=10, x=-3$

19.  $y = 2x^2 - x - 10$

$$y = (2x^2 + 4x)(-5x - 10)$$

$$y = 2x(x+2) - 5(x+2)$$

$$y = (2x-5)(x+2)$$

$$2x-5=0 \quad x+2=0$$

$$x = \frac{5}{2} \quad x = -2$$

Zeros:  $x = \frac{5}{2}, x = -2$

I can use characteristics to graph and write quadratic functions

In Exercises 20-21, write a quadratic function in standard form whose graph satisfies the given condition(s):

20. A graph whose vertex is at  $(h, k)$  and passes through the point  $(x, y)$ .

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

$$10 = a(4-6)^2 - 2$$

$$10 = 4a - 2$$

$$12 = 4a \quad a = 3$$

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

21. A graph passing through the points  $(-4, 0)$ ,  $(2, 0)$ , and  $(0, -4)$ .

$$y = a(x-p)(x-q)$$

$$-4 = a(0+4)(x-2)$$

$$-4 = -8a$$

$$a = \frac{1}{2}$$

$$y = \frac{1}{2}(x+4)(x-2)$$