

9-2 Reteaching

Quadratic Functions

Recall that the general equation for a quadratic function is $y = ax^2 + bx + c$.

Using this general equation, the equation for the axis of symmetry is $x = \frac{-b}{2a}$.

Since the vertex lies on the axis of symmetry, the x -coordinate of the vertex is $\frac{-b}{2a}$.

Problem

What are the equation of the axis of symmetry and the coordinates of the vertex of the graph of $y = 3x^2 + 6x - 4$?

$$x = \frac{-b}{2a} \quad \text{Equation for axis of symmetry}$$

$$x = \frac{-6}{2(3)} \quad a = 3 \text{ and } b = 6$$

$$x = -1 \quad \text{Simplify.}$$

Now, find the value of y when $x = -1$.

$$y = 3x^2 + 6x - 4$$

$$y = 3(-1)^2 + 6(-1) - 4$$

$$y = -7$$

The equation of the axis of symmetry is $x = -1$ and the coordinates of the vertex of the graph are $(-1, -7)$.

Exercises

Find the equation of the axis of symmetry and the coordinates of the vertex of the graph of each function.

1. $y = x^2 + 8x$

2. $y = 2x^2 + 12x + 10$

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

4. $y = 2x^2 - 4x - 5$

5. $y = -3x^2 + 18x - 25$

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

7. $f(x) = 6x^2 - 7$

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

9. $f(x) = 4x^2 - 16x - 2$

You can use the axis of symmetry and the vertex to help graph a quadratic equation. Use the equation $x = -\frac{b}{2a}$ to find the equation of the axis of symmetry. Because the vertex lies on the axis of symmetry, this value is also the x -coordinate of the vertex.

Problem

What is the graph of $y = 2x^2 - 4x + 1$?

1. Find the equation of the axis of symmetry.

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

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

$$x = 1$$

$$a = 2 \text{ and } b = -4$$

Simplify.

2. Find the vertex.

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

$$y = 2(1^2) - 4(1) + 1 \quad x = 1$$

$$y = -1$$

Simplify.

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

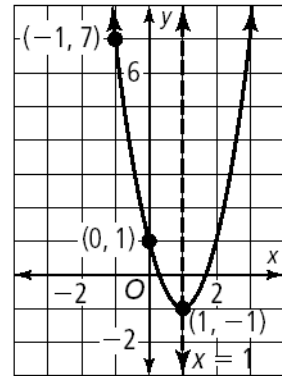
3. Graph the axis of symmetry $x = 1$ and the vertex $(1, -1)$.

4. Find a couple points on the graph.

For $x = 0$, $y = 2(0^2) - 4(0) + 1$ or 1. Plot $(0, 1)$.

For $x = -1$, $y = 2(-1)^2 - 4(-1) + 1$ or 7. Plot $(-1, 7)$.

5. Use the axis of symmetry to complete the graph.



Exercises

Graph each function. Label the axis of symmetry and the vertex.

10. $y = x^2 - 3$

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

12. $y = 2x^2 + 8x + 6$

