NAME ______________________ DATE ____________ PERIOD ____________

9-2 Study Guide and Intervention

Solving Quadratic Equations by Graphing

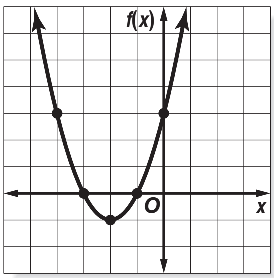
Solve by Graphing

Quadratic Equation	an equation of the form $ax^2 + bx + c = 0$, where $a \neq 0$

The solutions of a quadratic equation are called the **roots** of the equation. The roots of a quadratic equation can be found by graphing the related quadratic function $f(x) = ax^2 + bx + c$ and finding the x-intercepts or **zeros** of the function.

Example 1 **Solve $x^2 + 4x + 3 = 0$ by graphing.**

Graph the related function $f(x) = x^2 + 4x + 3$. The equation of the axis of symmetry is $x = -\frac{4}{2(1)}$ or -2. The vertex is at $(-2, -1)$. Graph the vertex and several other points on either side of the axis of symmetry.

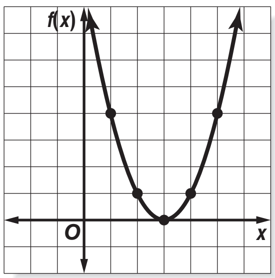


To solve $x^2 + 4x + 3 = 0$, you need to know where $f(x) = 0$. This occurs at the x-intercepts, -3 and -1.

The solutions are -3 and -1.

Example 2 **Solve $x^2 - 6x + 9 = 0$ by graphing.**

Graph the related function $f(x) = x^2 - 6x + 9$. The equation of the axis of symmetry is $x = \frac{6}{2(1)}$ or 3. The vertex is at $(3, 0)$. Graph the vertex and several other points on either side of the axis of symmetry.



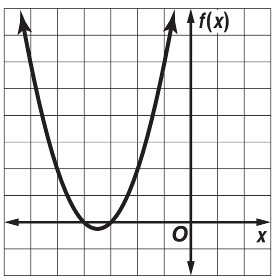
To solve $x^2 - 6x + 9 = 0$, you need to know where $f(x) = 0$. The vertex of the parabola is the x-intercept. Thus, the only solution is 3.

Lesson 9-2

Exercises

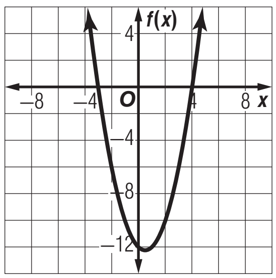
Solve each equation by graphing.

1. $x^2 + 7x + 12 = 0$



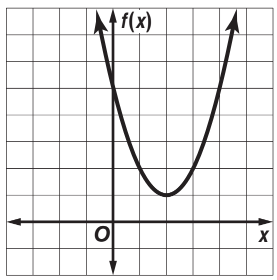
–3, –4

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



4, –3

3. $x^2 - 4x + 5 = 0$



no real roots

9-2 Study Guide and Intervention *(continued)*

Solving Quadratic Equations by Graphing

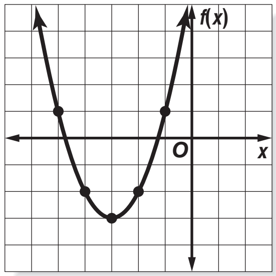
Estimate Solutions The roots of a quadratic equation may not be integers. If exact roots cannot be found, they can be estimated by finding the consecutive integers between which the roots lie.

Example **Solve $x^2 + 6x + 6 = 0$ by graphing. If integral roots cannot be found, estimate the roots by stating the consecutive integers between which the roots lie.**

Graph the related function $f(x) = x^2 + 6x + 6$.

x	$f(x)$
−5	1
−4	−2
−3	−3
−2	−2
−1	1

Notice that the value of the function changes from negative to positive between the x-values of −5 and −4 and between −2 and −1.

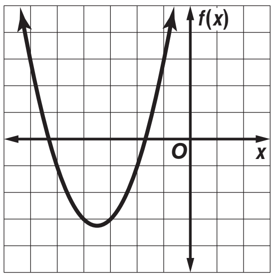


The x-intercepts of the graph are between −5 and −4 and between −2 and −1. So one root is between −5 and −4, and the other root is between −2 and −1.

Exercises

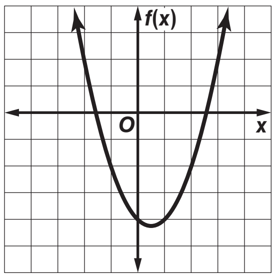
Solve each equation by graphing. If integral roots cannot be found, estimate the roots to the nearest tenth.

1. $x^2 + 7x + 9 = 0$



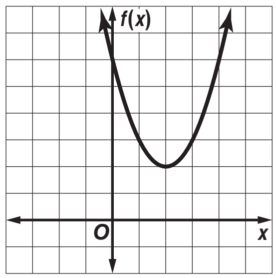
−6 < x < −5, −2 < x < −1

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



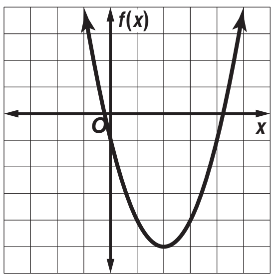
−2 < x < −1, 2 < x < 3

3. $x^2 - 4x + 6 = 0$



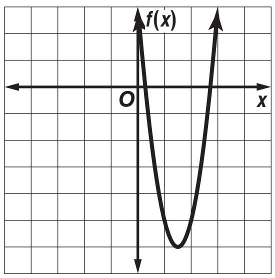
no real roots

4. $x^2 - 4x - 1 = 0$



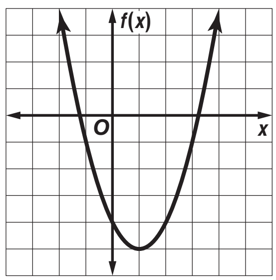
−1 < x < 0, 4 < x < 5

5. $4x^2 - 12x + 3 = 0$



0 < x < 1, 2 < x < 3

6. $x^2 - 2x - 4 = 0$



−2 < x < −1, 3 < x < 4