

# Study Guide and Intervention

## Solving Quadratic Equations by Graphing

### Solve by Graphing

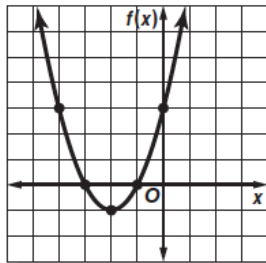
<b>Quadratic Equation</b>	an equation of the form $ax^2 + bx + c = 0$ , where $a \neq 0$
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The solutions of a quadratic equation are called the **roots** of the equation. The roots of a quadratic equation can be found by graphing the related quadratic 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.

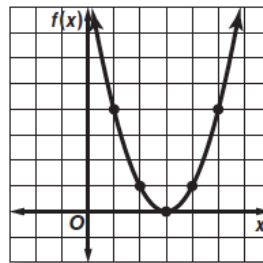


To solve  $x^2 + 4x + 3 = 0$ , you need to know where the value of  $f(x) = 0$ . This occurs at the  $x$ -intercepts,  $-3$  and  $-1$ . The solutions are  $-3$  and  $-1$ .

**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.

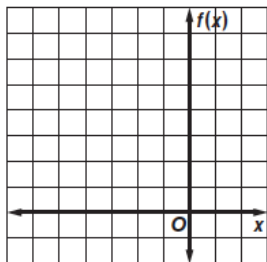


To solve  $x^2 - 6x + 9 = 0$ , you need to know where the value of  $f(x) = 0$ . The vertex of the parabola is the  $x$ -intercept. Thus, the only solution is  $3$ .

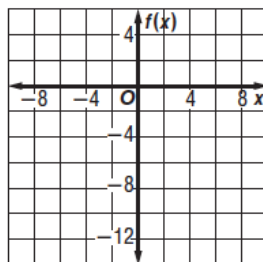
### Exercises

Solve each equation by graphing.

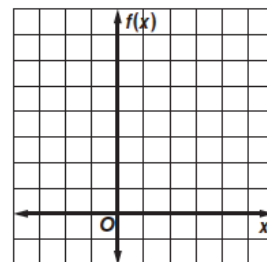
1.  $x^2 + 7x + 12 = 0$



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



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



## Study Guide and Intervention *(continued)*

### Solving Quadratic Equations by Graphing

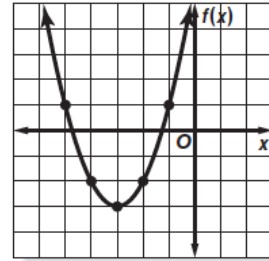
**Estimate Solutions** The roots of a quadratic equation may not be integers. If exact roots cannot be found, they can be estimated by finding the consecutive integers between which the roots lie.

**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  $-1$ .

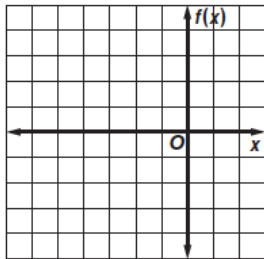


The  $x$ -intercepts of the graph are between  $-5$  and  $-4$  and between  $-2$  and  $-1$ . So one root is between  $-5$  and  $-4$ , and the other root is between  $-2$  and  $-1$ .

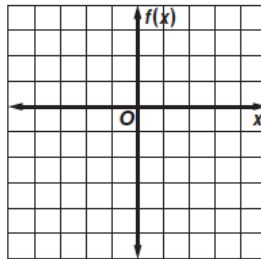
#### Exercises

Solve each equation by graphing. If integral roots cannot be found, estimate the roots by stating the consecutive integers between which the roots lie.

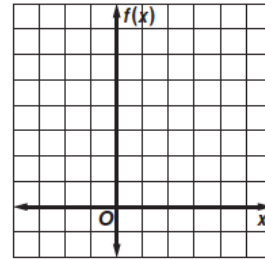
1.  $x^2 + 7x + 9 = 0$



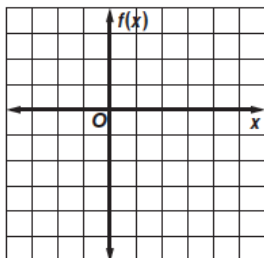
2.  $x^2 - x - 4 = 0$



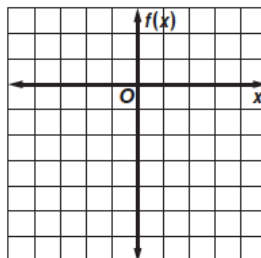
3.  $x^2 - 4x + 6 = 0$



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



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



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

