

# 9-2 Study Guide

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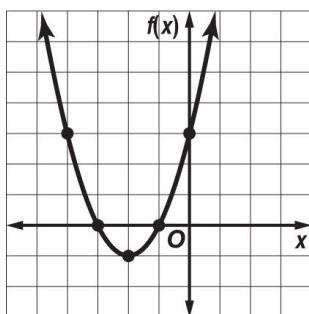
The solutions of a quadratic equation are called the **roots** of the equation. The roots of a quadratic equation can be found by graphing the related quadratic function  $f(x) = ax^2 + bx + c$  and finding the  $x$ -intercepts or **zeros** of the function.

#### 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.



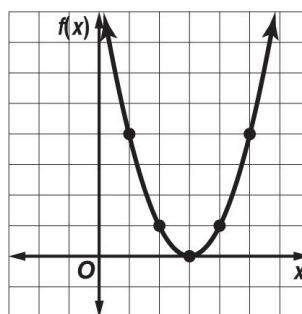
To solve  $x^2 + 4x + 3 = 0$ , you need to know where  $f(x) = 0$ . This occurs at the  $x$ -intercepts,  $-3$  and  $-1$ . The solutions are  $-3$  and  $-1$ .

#### 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.

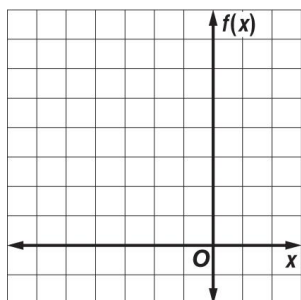


To solve  $x^2 - 6x + 9 = 0$ , you need to know where  $f(x) = 0$ . The vertex of the parabola is the  $x$ -intercept. Thus, the only solution is  $3$ .

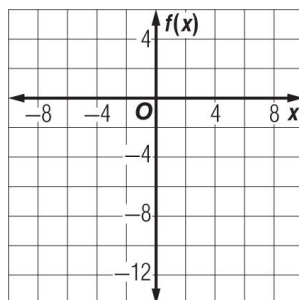
### Exercises

Solve each equation by graphing.

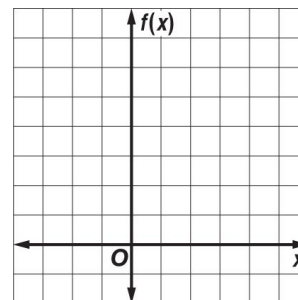
1.  $x^2 + 7x + 12 = 0$



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



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



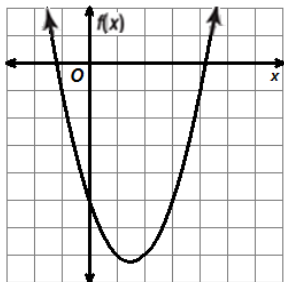
# 9-2 Study Guide (continued)

## 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 1:** Solve  $x^2 = 3x + 5$  by graphing. If integral roots cannot be found, estimate the roots to the nearest tenth.

Graph the related function  $f(x) = x^2 - 3x - 5$ .



The  $x$ -intercepts are located between  $-2$  and  $-1$  and between  $4$  and  $5$ .

Make a table using an increment of  $0.1$  for the  $x$ -values located between  $-2$  and  $-1$  and between  $4$  and  $5$ .

$x$	-1.9	-1.8	-1.7	-1.6	-1.5	-1.4	-1.3	-1.2	-1.1
$y$	4.3	3.6	3.0	2.4	1.8	1.2	0.6	0.0	-0.5

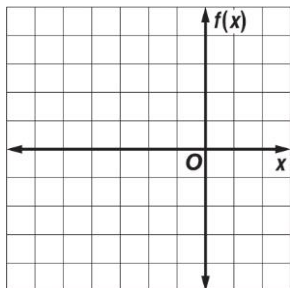
$x$	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9
$y$	-0.5	0.0	0.6	1.2	1.8	2.4	3.0	3.6	4.3

The values closest to zero are at  $-1.2$  and  $4.2$ . Thus, the roots are approximately  $-1.2$  and  $4.2$ .

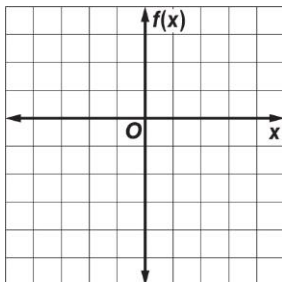
### Exercises

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

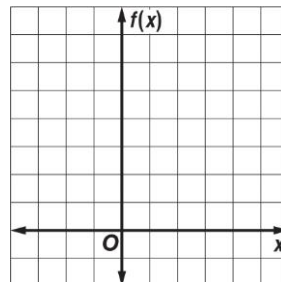
1.  $x^2 + 7x + 9 = 0$



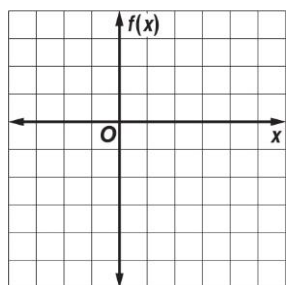
2.  $x^2 - x - 4 = 0$



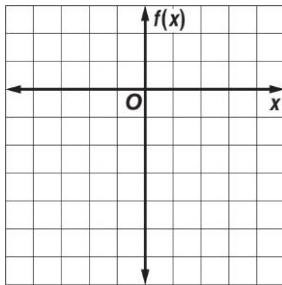
3.  $x^2 - 4x + 6 = 0$



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



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



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

