

LESSON
9.7**Study Guide**

For use with the lesson "Solve Systems with Quadratic Equations"

GOAL Solve systems of equations that include a quadratic equation.**EXAMPLE 1** Use the substitution method

$$\begin{array}{ll} \text{Solve the system:} & y = x + 4 \quad \text{Equation 1} \\ & y = 2x^2 + x - 4 \quad \text{Equation 2} \end{array}$$

Solution**STEP 1** Solve the linear equation for y . Equation 1 is already solved for y .**STEP 2** Substitute $x + 4$ for y in Equation 2 and solve for x .

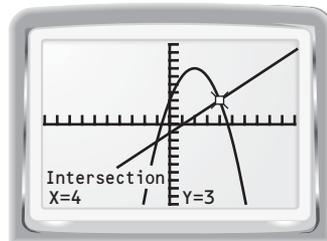
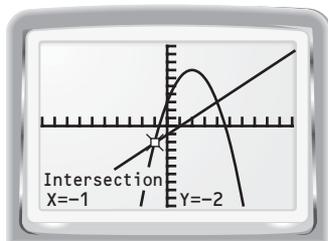
$$\begin{array}{ll} y = 2x^2 + x - 4 & \text{Write original Equation 2.} \\ x + 4 = 2x^2 + x - 4 & \text{Substitute } x + 4 \text{ for } y. \\ 0 = 2x^2 - 8 & \text{Subtract } x \text{ and } 4 \text{ from each side.} \\ 0 = 2(x - 2)(x + 2) & \text{Factor.} \\ x - 2 = 0 \quad \text{or} \quad x + 2 = 0 & \text{Zero-product property} \\ x = 2 \quad \text{or} \quad x = -2 & \text{Solve for } x. \end{array}$$

STEP 3 Substitute both -2 and 2 for x in Equation 1 and solve for y .

$$\begin{array}{ll} y = x + 4 & y = x + 4 \\ y = -2 + 4 & y = 2 + 4 \\ y = 2 & y = 6 \end{array}$$

The solutions are $(-2, 2)$ and $(2, 6)$.**EXAMPLE 2** Use a graphing calculator to solve a system

$$\begin{array}{ll} \text{Solve the system:} & y = x - 1 \quad \text{Equation 1} \\ & y = x^2 + 4x + 3 \quad \text{Equation 2} \end{array}$$

Solution**STEP 1** Enter each equation into your graphing calculator. Set $Y_1 = x - 1$ and $Y_2 = -x^2 + 4x + 3$.**STEP 2** Graph the system. Set a good viewing window. For this system, a good viewing window is $-10 \leq x \leq 10$ and $-10 \leq y \leq 10$.**STEP 3** Use the *Intersect* function to find the coordinates of each point of intersection. The points of intersection are $(-1, -2)$ and $(4, 3)$.The solutions are $(-1, -2)$ and $(4, 3)$. *continued*

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STEP 4 Check the solutions. For example, check $(-1, -2)$.

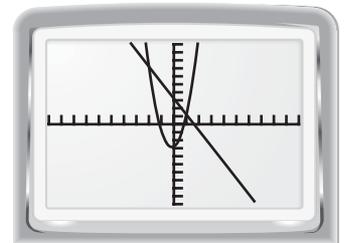
$$\begin{array}{rcl} y = x - 1 & & y = -x^2 + 4x + 3 \\ -2 \stackrel{?}{=} -1 - 1 & & -2 \stackrel{?}{=} -(-1)^2 + 4(-1) + 3 \\ -2 = -2 \checkmark & & -2 = -2 \checkmark \end{array}$$

Exercises for Examples 1 and 2**Solve the system of equations first by using the substitution method and then by using a graphing calculator.**

- | | | |
|--|---|--|
| 1. $y = -x^2 - x - 2$
$y = -2x - 4$ | 2. $y = 3 - x^2$
$y = 5x + 9$ | 3. $y = 2x^2 - x + 1$
$y = 3x + 7$ |
| 4. $y = 5x^2 - x + 2$
$y = -6x + 2$ | 5. $y = -2x^2 + 3x + 1$
$y = 9x + 1$ | 6. $y = x^2 - 4x - 8$
$y = -2x$ |
| 7. $y = -x^2 - 3x$
$y = -2x - 12$ | 8. $y = 3x^2 + 2x + 1$
$y = -x + 7$ | 9. $y = x^2 + 7x - 1$
$y = 3x + 11$ |

EXAMPLE 3**Solve an equation using a system****Solve the equation $3x^2 + x - 3 = -2x + 3$ using a system of equations. Check your solution(s).****Solution****STEP 1** Write a system of two equations by setting both the left and right sides of the given equation each equal to y .

$$\begin{array}{rcl} y = 3x^2 + x - 3 & & \text{Equation 1} \\ y = -2x + 3 & & \text{Equation 2} \end{array}$$

STEP 2 Graph Equation 1 and Equation 2 on the same coordinate plane or on a graphing calculator.**STEP 3** The x -value of each point of intersection is a solution of the original equation. The graphs intersect at $(-2, 7)$ and $(1, 1)$.The solutions of the equation are $x = -2$ and $x = 1$.**STEP 4** Check the solutions by substituting both solutions into the original equation.**Exercises for Example 3****Solve the equation using a system of equations.**

- | | |
|------------------------------|-------------------------------|
| 10. $4x + 5 = -x^2 + 2x + 5$ | 11. $-4x + 3 = 2x^2 - 4x + 1$ |
| 12. $6x + 3x^2 = 3x + 6$ | 13. $-8 = -x^2 - 2x$ |
| 14. $7 - x^2 = -x - 5$ | 15. $x^2 + 7x - 15 = -x - 22$ |