

LARSON ALGEBRA 2**CHAPTER 3, LESSON 6, EXTRA EXAMPLE****Extra Example 1 Using the Linear Combination Method**

Solve the system.

$$3x + y + z = 3 \quad \text{Equation 1}$$

$$4x - 2y + 3z = 4 \quad \text{Equation 2}$$

$$x + 2y - 2z = -8 \quad \text{Equation 3}$$

SOLUTION

1. Eliminate one of the variables in two of the original equations.

$$\begin{array}{r} 6x + 2y + 2z = 6 \\ \underline{4x - 2y + 3z = 4} \end{array} \quad \begin{array}{l} \text{Add } -2 \text{ times the first} \\ \text{equation to the second.} \end{array}$$

$$10x + 5z = 10 \quad \text{New Equation 1}$$

$$\begin{array}{r} 4x - 2y + 3z = 4 \\ \underline{x + 2y - 2z = -8} \end{array} \quad \begin{array}{l} \text{Add the second equation} \\ \text{to the third.} \end{array}$$

$$5x + z = -4 \quad \text{New Equation 2}$$

2. Solve the new system of linear equations in two variables.

$$\begin{array}{r} 10x + 5z = 10 \\ \underline{-10x - 2z = 8} \end{array} \quad \begin{array}{l} \text{New Equation 1} \\ \text{Add } -2 \text{ times the second equation.} \end{array}$$

$$3z = 18$$

$$z = 6 \quad \text{Solve for } z.$$

$$x = -2 \quad \text{Substitute into new Equation 1 or Equation 2 to find } x.$$

3. Substitute $x = -2$ and $z = 6$ into an original equation and solve for y .

$$3x + y + z = 3 \quad \text{Equation 1}$$

$$3(-2) + y + 6 = 3 \quad \text{Substitute } -2 \text{ for } x \text{ and } 6 \text{ for } z.$$

$$y = 3 \quad \text{Solve for } y.$$

- ◆ The solution is $x = -2$, $y = 3$, and $z = 6$, or the ordered triple $(-2, 3, 6)$. Check this solution in each of the original equations.

✓ CHECK

$$\text{Equation 1: } 3(-2) + 3 + 6 = 3 \quad \checkmark$$

$$\text{Equation 2: } 4(-2) - 2(3) + 3(6) = 4 \quad \checkmark$$

$$\text{Equation 3: } -2 + 2(3) - 2(6) = -8 \quad \checkmark$$