Name ______________________ Date ______________

LESSON 9.7

Challenge Practice

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

Consider a system of three linear equations in three variables. The solution of this system, if it exists, is an ordered triple of numbers (x, y, z) that satisfies all three equations. The solution of a system of three linear equations in three variables can be found by using a combination of the substitution and elimination methods.

EXAMPLE 2 Solve Systems in Three Variables

Solve the following linear system in three variables.

Equation 1: $x - y + 2z = -3$
Equation 2: $x + 3y - z = 8$
Equation 3: $x + 2y + 3z = 2$

Solution

STEP 1 Choose one of the equations and solve for one of the variables.

Equation 1: $x - y + 2z = -3$
$x = y - 2z - 3$

STEP 2 Substitute $y - 2z - 3$ for x in the other two equations and simplify.

Equation 2: $x + 3y - z = 8$
$(y - 2z - 3) + 3y - z = 8$
$4y - 3z = 11$

Equation 3: $x + 2y + 3z = 2$
$(y - 2z - 3) + 2y + 3z = 2$
$3y + z = 5$

STEP 3 Use the two equations from Step 2 and the elimination method to solve for y.

$4y - 3z = 11$
$3y + z = 5 \xrightarrow{\times 3} 3(3y + z) = 3(5) \longrightarrow$

$4y - 3z = 11$
$9y + 3z = 15$

Add the two equations on the right. $13y = 26$
Solve for y. $y = 2$

STEP 4 Substitute 2 for y in either equation in Step 2 and solve for z.

$3(2) + z = 5 \longrightarrow z = -1$

STEP 5 Substitute -1 for z and 2 for y one of the original three equations and solve for x; $x = 1$.

$x - 2 + 2(-1) = -3 \longrightarrow x = 1$

The solution to the system is the ordered triple $(x, y, z) = (1, 2, -1)$. Check this solution in all three of the original equations.

Solve each system.

1. $2x - y + z = -4$
$x + y + 3z = 2$
$3x + y - z = -6$

2. $x - y + z = -2$
$x + 2y - 3z = -6$
$-x - 3y + 2z = 5$

3. $2x - y + z = -3$
$-x + 2y - z = 2$
$3x + 2y + z = -2$

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