Name: ______________________________ Date: ______________ # ____

Section 3.6 Systems of 3 Equations

Learning Goal: To understand how to solve systems of linear equations in three variables and use linear systems in three variables to model real life situations.

Essential Questions:

What is the process for finding the solutions to a system of equations with three unknowns?

What does it mean when a false statement is obtained?

What does it mean when a true statement is obtained?

Warm Up:

1.

$$\begin{aligned} x+2y &= 16 \\ 0.5x - y &= 10 \end{aligned}$$

The solution to the system of equations above (x, y). What is the value of x?

A) -2

B) 2

C) 18

D) 36

2.

$$\begin{aligned} x^2 - 6x + 11 &= y \\ x &= y + 1 \end{aligned}$$

The system of equations above is graphed in the xy-plane. Which of the following is the y-coordinate of an intersection point (x, y) of the graphs of the two equations?

A) -4

B) -2

C) 2

D) 4

3. If $x^4 - y^4 = -15$ and $x^2 - y^2 = -3$, what is the value of $x^2 + y^2$?

A) 5

B) 4

C) 2

D) 1

4.
$$2x + 3y = 5$$
$$4x + cy = 8$$

In the system of equations above, c is a constant. For what value of c will there be no solution (x, y) to the system of equations?

A) 3

B) 4

C) 5

D) 6

Vocabulary:

System of three linear equations - three equations in the same variable

Solution – an ordered triple (x, y, z) that satisfies all three equations.

Linear Combination Method (3-Variable Systems) –

Step 1 - Use the linear combination method to rewrite the linear system in three variables as a linear system in two variables.

Step 2- Solve the new linear system for both of its variables.

Step 3 - Substitute the values found in Step 2 into one of the original equations and solve for the remaining variable.

Note: *if you obtain a false equation, such as 0 = 1, in any step, then the system has no solution. If you do not obtain a false solution but obtain a true statement, such as 0 = 0, then the equation is an identity and the system will have infinitely many solutions.*

Example 1:

$$x + y + z = 2$$
$$-x + 3y + 2z = 8$$
$$4x + y = 4$$

Example 2:

$$\begin{aligned} x - 2y - 3z &= -1 \\ 2x + y + z &= 6 \\ x + 3y - 2z &= 13 \end{aligned}$$

You Try:

1. $$\begin{aligned} 5x + 2y - z &= -7 \\ x - 2y + 2z &= 0 \\ 3y + z &= 17 \end{aligned}$$

2. $\begin{aligned} x + y + z &= 6 \\ 2x - y + z &= 3 \\ 3x - z &= 0 \end{aligned}$

3. $\begin{aligned} x + 3y + z &= 0 \\ x + y - z &= 0 \\ x - 2y - z &= 0 \end{aligned}$

4.

$$\begin{aligned} 3x - 2y + 4z &= 1 \\ x + y - 2z &= 3 \\ 2x - 3y + 6z &= 8 \end{aligned}$$

5.

$$\begin{aligned} x - 2y + 3z &= -4 \\ y - z &= 3 \\ z &= -1 \end{aligned}$$

6.
$$\begin{aligned} 2x + 3y - z &= 4 \\ 4x + 6y - 2z &= 6 \\ -2x + y + z &= -2 \end{aligned}$$

7.
$$\begin{aligned} x + 2y - 3z &= -8 \\ 2x + y + 3z &= 17 \\ x - 3y + 3z &= 11 \end{aligned}$$

8. $\begin{aligned} x+2y-4z&=2 \\ -x+2y-4z&=-2 \\ -x-2y+4z&=-2 \end{aligned}$

9. $\begin{aligned} x+y+z&=5 \\ 2x-y+z&=4 \\ 3x-y+2z&=8 \end{aligned}$

Closure:

Homework: