Name_____

Units 10 and 11: Linear Systems and Matrices Review

10.1: Solving Systems of Equations

- Solving systems of equations using substitution

1. $\begin{aligned} x - 3y &= -3 \\ x^2 + 6y &= 5 \end{aligned}$

10.2: Systems of Linear Equations in Two Variables

- Solving systems of equations using elimination

2. $\begin{aligned} 2x + 15y &= 4 \\ x - 3y &= 23 \end{aligned}$

10.3: Multivariable Linear Systems

- Solving systems of three equations and three variables or four equations and four variables.

3. $\begin{aligned} 4x - y + 5z &= 4 \\ 2x + y - z &= 0 \\ 2x + 4y + 8z &= 0 \end{aligned}$

4. $\begin{aligned} x - y - z &= 0 \\ 2x + 4y + z &= 0 \\ 3x + y - z &= 0 \end{aligned}$

11.1: Matrices and Systems of Equations

- Using elementary row operations on an augmented matrix to produce row echelon form or reduced row echelon form of a matrix
- Using Gaussian elimination or Gauss-Jordan elimination to solve a system using matrices.

5. $\begin{aligned} x + 3z &= -5 \\ 2x + y &= 0 \\ 3x + y - z &= 3 \end{aligned}$ (Make sure to fill in appropriate zeros.)

11.2: Operations with Matrices

- Matrix addition, scalar multiplication, and matrix multiplication

6. $\begin{bmatrix} 1 & 4 & 5 \\ 2 & 0 & -3 \end{bmatrix} \begin{bmatrix} 1 & 6 \\ 0 & -7 \\ -1 & 2 \end{bmatrix}$ (Multiply)

7. $A = \begin{bmatrix} 9 & 1 \\ -4 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & -2 \\ 3 & 5 \end{bmatrix}$, find $3A - 5B$

11.3: The Inverse of a Square Matrix

- Find the inverse of a square matrix if it exists
- Use the inverse matrix to solve systems of equations

8. $\begin{bmatrix} 1 & 1 & 1 \\ 3 & 6 & 5 \\ 6 & 10 & 8 \end{bmatrix}$, find the inverse if it exists

9. Use the inverse from #8 to solve the following system of equations $\begin{aligned} x + y + z &= 2 \\ 3x + 6y + 5z &= -3 \\ 6x + 10y + 8z &= 1 \end{aligned}$

11.4: The Determinant of a Square Matrix; Applications of Matrices and Determinants

- Finding the determinant of a 2x2 or 3x3 matrix without using the calculator
- Finding the determinant of larger square matrices using the graphing calculator
- Find the area of a triangle using determinants given the coordinates of its vertices
- Use Cramer's Rule to solve a system of linear equations

10. $\begin{bmatrix} 6 & -1 \\ 3 & 4 \end{bmatrix}$, find the determinant

11. $\begin{bmatrix} 1 & 3 & -1 \\ 5 & 9 & 0 \\ 6 & 2 & -5 \end{bmatrix}$, find the determinant

12. $\begin{bmatrix} 6 & 4 & 3 & 0 & 6 \\ 0 & 5 & 1 & 4 & 8 \\ 0 & 0 & 2 & 7 & 3 \\ 0 & 0 & 0 & 9 & 2 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$, find the determinant

13. Use a determinant to find the area of the triangle with vertices $(0,7), (5,0)$, and $(3,9)$.

14. Use Cramer's Rule to solve the system $\begin{aligned} 3x + z &= 1 \\ y + 4z &= 3 \\ x - y &= 2 \end{aligned}$ (Remember to fill in appropriate zeros)

**********ANSWERS**********

1. $x=-1,\ y=\frac{2}{3}$

2. $x=17,\ y=-2$

3. $x=\frac{1}{2},\ y=\frac{-3}{4},\ z=\frac{1}{4}$

4. $x=\frac{1}{2}a,\ y=\frac{-1}{2}a,\ z=a$

5. $\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & -2 \end{array}\right],\ x=1, y=-2, z=-2$

6. $\begin{bmatrix} -4 & -12 \\ 5 & 6 \end{bmatrix}$

7. $\begin{bmatrix} -3 & 13 \\ -27 & -1 \end{bmatrix}$

8. $\begin{bmatrix} 1 & -1 & \frac{1}{2} \\ -3 & -1 & 1 \\ 3 & 2 & -\frac{3}{2} \end{bmatrix}$

9. $\begin{bmatrix} \frac{11}{2} \\ -2 \\ -\frac{3}{2} \end{bmatrix},\ x=\frac{11}{2}, y=-2, z=-\frac{3}{2}$

10. 27

11. 74

12. 540

13. 15.5 square units

14. $x=-\frac{1}{11}, y=-\frac{23}{11}, z=\frac{14}{11}$