Cramer's Rule

Step 1: Organize the system of equations so that the variables of the first equation line up with the variables of the second equation.

$$-5x + 3y = -1$$
$$x + 6y = 53$$

Step 2: Write the equations in matrix form.

$$\begin{bmatrix} -5 & 3 \\ 1 & 6 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -1 \\ 53 \end{bmatrix}$$

Step 3: Find the determinant of the original coefficient matrix; if the determinant of the original coefficient matrix is zero, then no unique solution exists.

$$D = \begin{vmatrix} -5 & 3 \\ 1 & 6 \end{vmatrix} = (-5)(6) - (1)(3) = -30 - 3 = -33$$

Step 4: Substitute the "answer" matrix into the column of the original coefficient matrix for which the variable will be solved.

$$Solving\ for\ x: \begin{bmatrix} -5 & 3 \\ 1 & 6 \end{bmatrix} \rightarrow \begin{bmatrix} -1 & 3 \\ 53 & 6 \end{bmatrix}$$

Step 5: Find the determinant of the new matrix.

$$D_x = \begin{vmatrix} -1 & 3 \\ 53 & 6 \end{vmatrix} = (-1)(6) - (53)(3) = -6 - 159 = -165$$

Step 6: Divided the new determinant by the original determinant in order to solve for the unknown variable.

$$x = \frac{D_x}{D} = \frac{-165}{-33} = 5$$

Step 7: To solve for other variables, repeat steps 3-5.

$$Solving\ for\ y: \begin{bmatrix} -5 & 3 \\ 1 & 6 \end{bmatrix} \rightarrow \begin{bmatrix} -5 & -1 \\ 1 & 53 \end{bmatrix}$$

$$D_y = \begin{vmatrix} -5 & -1 \\ 1 & 53 \end{vmatrix} = (-5)(53) - (1)(-1) = -265 + 1 = -264$$

$$y = \frac{D_y}{D} = \frac{-264}{-33} = 8$$

Algebra 2 Name_____

Assignment

Date_____ Period____

Use Cramer's Rule to solve each system.

1) $-5x - 4y = -8$
$-3x - y = -2$

2) $2x - 4y = 12$
$x - 2y = 6$

3) $2x - 5y = 19$
$-3x - y = -3$

4) $2x + 6y = 14$
$4x - y = 2$

5) $x - 4y = 6$
$-2x - y = -3$

6) $2x - 2y = 2$
$3x - 3y = 3$

7) $4x - y = -3$
$-x - 3y = 17$

8) $-2x - 2y = 10$
$3x - 3y = -21$

9) $6x - 4y = 20$
$-5x - 5y = 25$

10) $-2x - 6y = 14$
$5x + 6y = 1$

Solving Matrix Equations with Inverses

Date_____ Block____

Solve each equation.

1) $3B = \begin{bmatrix} 33 & -6 & -18 \end{bmatrix}$

2) $\begin{bmatrix} -25 \\ 15 \end{bmatrix} = 5X$

3) $\begin{bmatrix} 0 & 10 & -4 \end{bmatrix} - X = \begin{bmatrix} -4 & 2 & -8 \end{bmatrix}$

4) $-2Z = \begin{bmatrix} -14 \\ -8 \\ -8 \end{bmatrix}$

Solve each equation or state if there is no unique solution.

5) $\begin{bmatrix} 5 & 7 \\ 0 & 0 \end{bmatrix} X = \begin{bmatrix} -8 \\ 0 \end{bmatrix}$

6) $\begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix} X = \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$

7) $\begin{bmatrix} -1 & 0 \\ 5 & -5 \end{bmatrix} C = \begin{bmatrix} 8 & -2 \\ -10 & -25 \end{bmatrix}$

8) $\begin{bmatrix} 6 & 2 \\ -10 & -4 \end{bmatrix} B = \begin{bmatrix} -12 \\ 26 \end{bmatrix}$

9) $\begin{bmatrix} 2 & -6 \\ -1 & 3 \end{bmatrix} X = \begin{bmatrix} 10 & -18 \\ -5 & 9 \end{bmatrix}$

10) $\begin{bmatrix} 1 & 5 \\ 0 & -5 \end{bmatrix} A - \begin{bmatrix} 6 \\ 2 \end{bmatrix} = \begin{bmatrix} 24 \\ -37 \end{bmatrix}$