

Name: _____
PCH: Cramer's Rule

Date: _____
Ms. Loughran

Do Now:

1. Find $\begin{vmatrix} c & a & t \\ d & o & g \\ e & m & u \end{vmatrix}$

2. $\begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix} \cdot \begin{bmatrix} g & h \\ i & j \\ k & l \end{bmatrix}$

3. Solve the systems of equations algebraically:

$$-4x - 6z = -12$$

$$-6x - 4y - 2z = 6$$

$$-x + 2y + z = 9$$

Let's take the coefficient matrix of the system of equations in Do Now 3.

$$D = \begin{bmatrix} & \\ & \end{bmatrix}$$

Find $|D|$.

Now, let's take the **augmented matrix** of the system of equations given to you in Do Now 3

$$\left[\begin{array}{c|c} & \\ \hline & \end{array} \right]$$

Replace the **first** column of D with the last column of the augmented matrix given above.

$$D_x = \begin{bmatrix} & \\ & \end{bmatrix}$$

Divide $|D_x|$ by $|D|$ and record your answer here. _____

What do you notice? How can we find the other values of y and z ?

Cramer's rule to solve systems of linear equations

Steps:

1. Set up a coefficient matrix.
2. Find the determinant of the coefficient matrix. If the determinant $\neq 0$ you can use Cramer's Rule.
3. To find x value, replace first column (x column) with the answer column and find determinant. Now divide this determinant by the original matrix's determinant, this quotient is your x value.
4. To solve for y value, replace second column (y column) with the answer column and find the determinant. Now divide this determinant by the original matrix's determinant, this quotient is your y value.

Practice

Solve each of the following systems using Cramer's Rule, if possible.

1.
$$\begin{aligned} 5x + 4y &= 2 \\ -x + y &= -22 \end{aligned}$$

$$2. \begin{cases} 2x - 5y = 2 \\ 3x - 7y = 1 \end{cases}$$

$$3. \begin{cases} -2x + 8y = 1 \\ x - 4y = 5 \end{cases}$$

More Practice

Solve each of the following systems using Cramer's Rule, if possible.

1.
$$\begin{aligned} 3x - 10y &= 15 \\ 5x + 4y &= 22 \end{aligned}$$

2.
$$\begin{aligned} 2x + y &= 0.3 \\ 3x - y &= -1.3 \end{aligned}$$

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

4.
$$\begin{aligned} 2x - 3y + 4z &= 10 \\ 6x - 9y + 12z &= 24 \\ x + 2y - 3z &= 5 \end{aligned}$$