WAYS TO SOLVE SYSTEMS OF EQS: ① Graphing ② Substitution ③ Elimination ④ Inverse Matrices ⑤ Cramer's Rule

Day 39

⑥ 4-8 Augmented Matrices & Systems

An augmented matrix contains the coefficients and the constants from a system of equations.

2 rows, 3 columns

ex $\begin{cases} 1x - 5y = 15 \\ 3x + 3y = 3 \end{cases}$

Augmented Matrix

$$\left[\begin{array}{cc|c} 1 & -5 & 15 \\ 3 & 3 & 3 \end{array}\right]$$

↑ The bar separates the coefficients from the constants

Put the 2×3 matrix in,

2nd [mode]

2nd [x^{-1}] → MATH

B: rref(

[ENTER]

2nd [x^{-1}] type in matrix used

screen should say rref([A])

$$\left[\begin{array}{cc|c} 1 & 0 & 3\frac{1}{3} \\ 0 & 1 & -2\frac{1}{3} \end{array}\right]$$

↑ answer

should always be the identity matrix

, so $x = 10/3$, $y = -7/3$

OR $\left(3\frac{1}{3}, -2\frac{1}{3}\right)$

ex2 $\begin{cases} x - 3y = -17 \\ 4x + 2y = 2 \end{cases}$

$$\left[\begin{array}{cc|c} 1 & -3 & -17 \\ 4 & 2 & 2 \end{array}\right] = \left[\begin{array}{cc|c} 1 & 0 & -2 \\ 0 & 1 & 5 \end{array}\right]$$

x, y

$(-2, 5)$

x y

WORK Augmented

Augmented

ex 3
$$\begin{cases} 2x+3y-1z=11 \\ 3x-2y+4z=10 \\ 1x+4y-2z=8 \end{cases}$$

should always be the identity matrix

$$\begin{bmatrix} 2 & 3 & -1 & 11 \\ 3 & -2 & 4 & 10 \\ 1 & 4 & -2 & 8 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 4 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

calculator: A rref[A]

(4, 1, 0)
x y z

ex 4
$$\begin{cases} 4x+3y+z=-1 \\ -2x-2y+7z=-10 \\ 3x+y+5z=2 \end{cases}$$

(7, −9, −2)

x = y = z =

$$\begin{bmatrix} 4x & 3 \\ 7 & 2y \end{bmatrix} + \begin{bmatrix} 5 & -1 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 18 & 4 \\ 0 & 2 \end{bmatrix}$$

$4x+5=18$ $2y+4=2$

$$\begin{bmatrix} 4x \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 5y \\ 2y \\ 0 \end{bmatrix} + \begin{bmatrix} 3z \\ 4z \\ 6z \end{bmatrix} = \begin{bmatrix} 6 \\ 8 \\ -12 \end{bmatrix}$$

$2y+4(-2)=8$ $\frac{6z}{6}=\frac{-12}{6}$ $(z=-2)$