Turning a system of equations into a matrix equation:

$8x - 5y = -23$
$6x + 7y = 15$ $\longrightarrow$ $AX = B$

A • X = B

Matrix A is called the Coefficient Matrix:

Matrix X is called the Variable Matrix:

Matrix B is called the Constant (or Answer) Matrix:

Solve this by doing:

$X = A^{-1} B$

as an ordered pair the answer is: (-1, 3)

When using matrices to solve a system of equations both equations must be in Standard Form.

When you solve you will always do this:

$$\begin{bmatrix} X \\ Y \end{bmatrix} = A^{-1} \cdot B$$

Use matrices to solve this system of equations:

$2.7x - 3.4y = 2.47$
$8.6x + 9.5y = 30.23$

$(2.3, 1.1)$

$A^{-1}B = \begin{bmatrix} 2.3 \\ 1.1 \end{bmatrix}$

$\begin{bmatrix} 2.7 & -3.4 \\ 8.6 & 9.5 \end{bmatrix} X = \begin{bmatrix} 2.47 \\ 30.23 \end{bmatrix}$

Solve.

$148x + 137y = -863$
$-86x + 191y = -1934$

$(2.5, -9)$

$A^{-1} \cdot B = \begin{bmatrix} 2.5 \\ -9 \end{bmatrix}$

$\begin{bmatrix} 148 & 137 \\ -86 & 191 \end{bmatrix} X = \begin{bmatrix} -863 \\ -1934 \end{bmatrix}$

Solve.

$$\frac{2}{3}x - \frac{5}{6}y = 31$$
$$\frac{7}{4}x + \frac{1}{9}y = 40$$

$A^{-1}B = \begin{bmatrix} 24 \\ -18 \end{bmatrix}$

$$\begin{bmatrix} 2/3 & -5/6 \\ 7/4 & 1/9 \end{bmatrix} X = \begin{bmatrix} 31 \\ 40 \end{bmatrix}$$

(24, −18)

Use matrices to solve this system of equations:

$y = 4x - 8 \rightarrow -4x + y = -8$

$6x + 7y = -5$

(1.5, −2)

$$\begin{bmatrix} -4 & 1 \\ 6 & 7 \end{bmatrix} X = \begin{bmatrix} -8 \\ -5 \end{bmatrix}$$

$A^{-1} \cdot B = \begin{bmatrix} 1.5 \\ -2 \end{bmatrix}$

Use matrices to solve this system of equations:

$x = 4$

$7x - 5y = 23$

$$\begin{bmatrix} 1 & 0 \\ 7 & -5 \end{bmatrix} X = \begin{bmatrix} 4 \\ 23 \end{bmatrix}$$

$A^{-1} \cdot B = \begin{bmatrix} 4 \\ 1 \end{bmatrix} \rightarrow$ (4, 1)

Solve this system of equations:

$3(4x - 10y = 18) \quad 12x - 30y = 54$

$2(6x - 15y = 27) \quad 12x - 30y = 54$

Using Elimination we find that these are really the same line, therefore, there are MANY SOLUTIONS

Many Sol

If you try to solve this system of equations with matrices you'll get an error message which indicates you can't use matrices to solve this system. This means that the system either has NO SOLUTION or MANY SOLUTIONS. To determine which answer is correct you need to use either Elimination or Substitution.

Solve this system of equations. Give answer as an ordered triple.

$-x + 3y - 5z = -24$
$-7x + 4z = 48$
$-3x - 4y + z = -3$

$A^{-1}B = \begin{bmatrix} 4 \\ -1 \\ 5 \end{bmatrix}$

$(4, -1, 5)$

$\begin{bmatrix} 1 & 3 & -5 \\ 7 & 0 & 4 \\ -3 & -4 & 1 \end{bmatrix} X = \begin{bmatrix} -24 \\ 48 \\ -3 \end{bmatrix}$

A B

Solve this system of equations. Give answer as an ordered triple.

$x - 3z = -7$
$5y + z = -6$
$7x - 8y = 51$

$(5, -2, 4)$

$A^{-1}B = \begin{bmatrix} 5 \\ -2 \\ 4 \end{bmatrix}$

$\begin{bmatrix} 1 & 0 & -3 \\ 0 & 5 & 1 \\ 7 & -8 & 0 \end{bmatrix} X = \begin{bmatrix} -7 \\ -6 \\ 51 \end{bmatrix}$

A B

Last week I bought some Cokes and Milky Way bars from the vending machine. Cokes cost $1.85 each and Milky Way bars cost $1.55 each. I spent a total of $12.05.

This week I bought the same number of Cokes and Milky Way bars but the prices went up to $2.15 for a Coke and $1.75 for a Milky Way bar. I spent a total of $13.85.

How many of each did I purchase each week?

$1.85C + 1.55M = 12.05$
$2.15C + 1.75M = 13.85$

$\begin{bmatrix} 1.85 & 1.55 \\ 2.15 & 1.75 \end{bmatrix} X = \begin{bmatrix} 12.05 \\ 13.85 \end{bmatrix}$

A B

$A^{-1}B = \begin{bmatrix} 4 \\ 3 \end{bmatrix}$

4 cokes
3 milky way

A package delivery service delivers three sizes of boxes, Small, Medium, and Large. They charge different prices for different sizes of boxes.

On Monday, the driver delivered 5 small, 2 medium, and 7 large boxes and brought back $405.
On Tuesday, the driver delivered 4small and 15 medium boxes and brought back $435.
On Wednesday, the driver delivered 1 small, 5 medium, and 11 large boxes and brought back $580.

What is the cost for delivery of each size box?

$5S + 2M + 7L = 405$
$4S + 15M + 0L = 435$
$S + 5M + 11L = 580$

$\begin{bmatrix} 5 & 2 & 7 \\ 4 & 15 & 0 \\ 1 & 5 & 11 \end{bmatrix} X = \begin{bmatrix} 405 \\ 435 \\ 580 \end{bmatrix}$

A B

$A^{-1}B = \begin{bmatrix} 15 \\ 25 \\ 40 \end{bmatrix}$

S = $15
M = $25
L = $40