

4.8 – Using Matrices to Solve Systems of Equations

Alg 2 Trig G



A matrix equation for a system of equations consists of the product of the coefficient and variable matrices on the left and the constant matrix on the right of the equals sign.

Write a matrix equation for each system of equations:

1. $3x - 7y = 12$
 $x + 5y = -8$

$$\begin{bmatrix} 3 & -7 \\ 1 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 12 \\ -8 \end{bmatrix}$$

↑ Coefficients ↑ variables

3. $5x + 2y = 18$
 $x = -4y + 25$

$$x + 4y = 25$$

$$\begin{bmatrix} 5 & 2 \\ 1 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 18 \\ 25 \end{bmatrix}$$

2. $2x - y + 3z = -7$
 $x + 3y - 4z = 15$
 $7x + 2y + z = -28$

$$\begin{bmatrix} 2 & -1 & 3 \\ 1 & 3 & -4 \\ 7 & 2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -7 \\ 15 \\ -28 \end{bmatrix}$$

How to solve a matrix equation in your calculator:

$5x - y + 7z = 32$
 $x + 3y - 2z = -18$
 $2x + 4y - 3z = 12$

WRITE THE MATRIX EQUATION:

dimensions of
a matrix:
ROWS x COLUMNS

$$\begin{bmatrix} 5 & -1 & 7 \\ 1 & 3 & -2 \\ 2 & 4 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 32 \\ -18 \\ 12 \end{bmatrix}$$

$[A]$ $[B]$
 3×3 3×1

PRESS 2^{nd} x^{-1} (MATRX)

GO OVER TO EDIT and CHOOSE THE $[A]$

ENTER THE SIZE OF THE FIRST MATRIX (rows x columns)

ENTER THE VALUES IN THE MATRIX YOU WROTE

AGAIN, PRESS 2^{nd} x^{-1} (MATRX)

GO OVER TO EDIT and CHOOSE THE $[B]$

ENTER THE SIZE OF THE SECOND MATRIX (rows x columns)

ENTER THE VALUES IN THE MATRIX YOU WROTE

PRESS 2^{nd} MODE (QUIT)

PRESS 2^{nd} x^{-1} (MATRX)

STAY ON NAMES and CHOOSE 1: $[A]$

PRESS THE x^{-1}
 PRESS 2^{nd} x^{-1} (MATRX)
 STAY ON NAMES and CHOOSE 1: $[B]$
 (YOU SHOULD SEE $[A]^{-1}[B]$ ON THE SCREEN)
 PRESS ENTER

$$[A]^{-1}[B] \star$$

The resulting matrix is your answer!!!!

$$\begin{aligned} x &= 39.44 \\ y &= -38.56 \\ z &= -29.11 \end{aligned}$$

Practice!

1. $2x + 3y = 6$
 $3x - 4y = 7$

$$\begin{aligned} x &= 2.65 \\ y &= .24 \end{aligned}$$

2. $r - s = 1$
 $3s = 12 - 2r$

$$2r + 3s = 12$$

$$\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} r \\ s \end{bmatrix} = \begin{bmatrix} 1 \\ 12 \end{bmatrix}$$

$2 \times 2 \qquad \qquad 2 \times 1$

$$\begin{aligned} r &= 3 \\ s &= 2 \end{aligned}$$

3. $6x - y + 2z = -4$
 $-3x + 2y - z = 10$
 $x + y + z = 3$

$$\begin{aligned} x &= 1.5 \\ y &= 5.33 \\ z &= -3.83 \end{aligned}$$

4. $a - b + c = 5$
 $3a + 2b - c = 0$
 $2a + 3b = 8$

$$\begin{bmatrix} 1 & -1 & 1 \\ 3 & 2 & -1 \\ 2 & 3 & 0 \end{bmatrix}$$

$$+06$$

$$\begin{aligned} a &= .7 \\ b &= 2.2 \\ c &= 6.5 \end{aligned}$$

