Section 3.8 Use Matrices to Solve Equations

- ✓Write a matrix equation for a system
- ✓Solve the system using matrix operations

For the system $x + 3y = 3$
$x + 2y = 7$

Write a matrix equation

coefficient matrix · *variable matrix* = *constant matrix*

$$\begin{bmatrix} 1 & 3 \\ 1 & 2 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ 7 \end{bmatrix}$$

↓

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

Find the inverse of the coefficient matrix

Multiply both sides of the matrix equation by the inverse

$$\begin{bmatrix} -2 & 3 \\ 1 & -1 \end{bmatrix} \quad \begin{bmatrix} 1 & 3 \\ 1 & 2 \end{bmatrix} \bullet \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} 3 \\ 7 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 15 \\ -4 \end{bmatrix}$$

Solution: x = 15, y = -4 (15, -4)

Example: Solve using matrices:

$5x + 3y = 13$

$4x + 7y = -8$

Write the matrix equation

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

-Load the coefficient and constant matrices in TI84

-Multiply both sides of the equation by the inverse matrix (use inverse $^{-1}$ key)

Example: Solve using matrices:

$3x - 2y + z = 0$

$2x + 3y - z = 17$

$5x - y + 4z = -7$

Write the matrix equation

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

Load the matrices into your TI84

Multiply both sides by the inverse matrix