4.6. Matrix Equations and System of Linear Equations

Wednesday, February 21, 2018 12:29 PM

Goals: (1) Use matrix equation to solve a system of linear equations.

(2) Solve some applications.

Recall: Simple linear equation:

$$5x = 7$$

Solve for x:

$$\frac{1}{5} \cdot 5x = \frac{1}{5} \cdot 7$$

$$x = \frac{7}{5}.$$

⟶ Multiply both sides by the inverse of the coefficient.

For matrices:

$$3x - 5y = 8$$
$$-4x - 6y = 10$$

Solve for x, y.

$$\begin{pmatrix} 3 & -5 \\ -4 & -6 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ 10 \end{pmatrix}$$

A X B

$$A \cdot X = B$$

→ Multiply both sides by A^{-1}.

$$A^{-1} \cdot A \cdot X = A^{-1} \cdot B$$

$$I \cdot X$$

$$X = A^{-1} \cdot B$$

→ Find A^{-1} and multiply it to the left of B.

$\rightarrow \begin{pmatrix} -1/19 \\ -31/19 \end{pmatrix} \begin{matrix} \rightarrow x \\ \rightarrow y \end{matrix}$

E.g. $x + y + 2z = 1$

$2x + y = 2$

$x + 2y + 2z = 3$

Write this as a matrix equation and use the TI to solve for x, y, z.

$$\begin{pmatrix} 1 & 1 & 2 \\ 2 & 1 & 0 \\ 1 & 2 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$$

$A \cdot X = B$

$\rightarrow X = ?$

$x = 0$

$y = 2$

$z = -1/2$