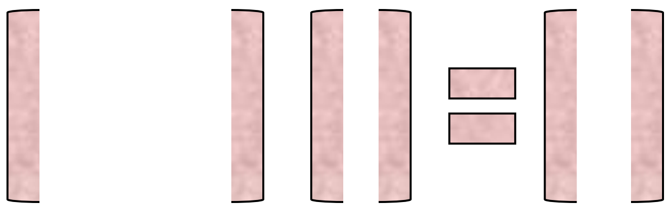
MATRIX EQUATION – Example 1

- Consider the following set of equations:

$$\begin{aligned} x_1 - x_2 &= 3 \\ 2x_1 + x_2 &= 9 \end{aligned}$$

- How can we write this in the form of matrix multiplication Ax=b?



$$\begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 3 \\ 9 \end{bmatrix}$$

SOLVING MATRIX EQUATIONS USING INVERSE

- $Ax = b$
- $A^{-1}Ax = A^{-1}b$
- $Ix = A^{-1}b$
- $x = A^{-1}b$

MATRIX EQUATION – Example 2

- Consider following system

$$x_1 + 2x_2 - x_3 = 4$$
$$-5x_2 + 3x_3 = 1$$

- What is the above in the Ax = b format?

$$\begin{bmatrix} 1 & 2 & -1 \\ 0 & -5 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$$

MATRIX EQUATION - Example 2

- Also note, that we can write $$\begin{bmatrix} 1 & 2 & -1 \\ 0 & -5 & 3 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$$

- as this: $$x_1\begin{bmatrix} 1 \\ 0 \end{bmatrix} + x_2\begin{bmatrix} 2 \\ -5 \end{bmatrix} + x_3\begin{bmatrix} -1 \\ 3 \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$$

- The above expression is called **Linear Combination** of columns of A.