6.2.6

EE25BTECH11060 - V.Namaswi

Question

Find matrix X such that

$$X\begin{pmatrix}1 & 2 & 3\\ 4 & 5 & 6\end{pmatrix}=\begin{pmatrix}-7 & -8 & -9\\ 2 & 4 & 6\end{pmatrix} \tag{1}$$

Solution

As X is a 2x2 matrix,

First solving for Row 1

Formation of Argumented Matrix

$$\left(\begin{array}{cc|c}1 & 4 & -7\\ 2 & 5 & -8\\ 3 & 6 & -9\end{array}\right) \tag{2}$$

Replace $R_2 \to R_2 - 2R_1$

$$\left(\begin{array}{cc|c}1 & 4 & -7\\ 0 & -3 & 6\\ 3 & 6 & -9\end{array}\right) \tag{3}$$

Replace $R_3 \to R_3 - 3R_1$

$$\left(\begin{array}{cc|c}1 & 4 & -7\\ 0 & -3 & 6\\ 0 & -6 & 12\end{array}\right) \tag{4}$$

Replace $R_3 \to R_3 - 2R_2$

$$\left(\begin{array}{cc|c}1 & 4 & -7\\ 0 & -3 & 6\\ 0 & 0 & 0\end{array}\right) \tag{5}$$

So,Row 1

$$\begin{pmatrix}1 & -2\end{pmatrix} \tag{6}$$

Solving for Row 2

Formation of Argumented Matrix

$$\left(\begin{array}{cc|c}1 & 4 & -7\\ 2 & 5 & -8\\ 3 & 6 & -9\end{array}\right) \tag{7}$$

Replace $R_3 \rightarrow R_3 - R_2$

$$\left(\begin{array}{cc|c} 1 & 4 & -7 \\ 2 & 5 & -8 \\ 1 & 1 & -1 \end{array}\right) \tag{8}$$

Replace $R_2 \rightarrow R_2 - (R_1 + R_3)$

$$\left(\begin{array}{cc|c} 1 & 4 & -7 \\ 0 & 0 & 0 \\ 1 & 1 & -1 \end{array}\right) \tag{9}$$

Replace $R_3 \rightarrow R_3 - R_1$

$$\left(\begin{array}{cc|c} 1 & 4 & -7 \\ 0 & 0 & 0 \\ 0 & -3 & 6 \end{array}\right) \tag{10}$$

So,Row 2

$$\begin{pmatrix} 1 & -2 \end{pmatrix} \tag{11}$$

Hence $\mathbf{X}$

$$= \begin{pmatrix} 1 & -2 \\ 1 & -2 \end{pmatrix} \tag{12}$$