

5.4.18

EE25BTECH11023 - Venkata Sai

Question:

Using elementary transformations, find the inverse of the following matrix.

$$\begin{pmatrix} 4 & 5 \\ 3 & 4 \end{pmatrix}$$

Solution: Given

$$\mathbf{A} = \begin{pmatrix} 4 & 5 \\ 3 & 4 \end{pmatrix} \quad (1)$$

Let \mathbf{A}^{-1} be the inverse of \mathbf{A} . Then

$$\mathbf{A}\mathbf{A}^{-1} = \mathbf{I} \quad (2)$$

Augmented matrix of $(\mathbf{A} \mid \mathbf{I})$ is given by

$$\left(\begin{array}{cc|cc} 4 & 5 & 1 & 0 \\ 3 & 4 & 0 & 1 \end{array} \right) \xrightarrow{R_2 \rightarrow 4R_2 - 3R_1} \left(\begin{array}{cc|cc} 4 & 5 & 1 & 0 \\ 0 & 1 & -3 & 4 \end{array} \right) \xrightarrow{R_1 \rightarrow R_1 - 5R_2} \left(\begin{array}{cc|cc} 4 & 0 & 16 & -20 \\ 0 & 1 & -3 & 4 \end{array} \right) \quad (3)$$

$$\left(\begin{array}{cc|cc} 4 & 0 & 16 & -20 \\ 0 & 1 & -3 & 4 \end{array} \right) \xrightarrow{R_1 \rightarrow \frac{1}{4}R_1} \left(\begin{array}{cc|cc} 1 & 0 & 4 & -5 \\ 0 & 1 & -3 & 4 \end{array} \right) \quad (4)$$

Hence the inverse of the matrix $\begin{pmatrix} 4 & 5 \\ 3 & 4 \end{pmatrix}$ is $\begin{pmatrix} 4 & -5 \\ -3 & 4 \end{pmatrix}$