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Class - XIIth

Subject - Mathematics

Topic - Matrices

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Ex 3.4 (M.C.E.R.T)

Q.7 Find A^{-1} if $A = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$

Solution: Given that $A = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$

we write

$$A = IA$$

$$\Rightarrow \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} A$$

Applying $2R_1 - R_2$, we get

$$\begin{bmatrix} 6-5 & 2-2 \\ 5 & 2 \end{bmatrix} = \begin{bmatrix} 2 \times 1 - 0 & 2 \times 0 - 1 \\ 0 & 1 \end{bmatrix} A$$

$$\Rightarrow \begin{bmatrix} 1 & 0 \\ 5 & 2 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 0 & 1 \end{bmatrix} A$$

$\Rightarrow$ Applying $R_2 - 5R_1$, we get

$$\begin{bmatrix} 1 & 0 \\ 5-5 \times 1 & 2-5 \times 0 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 0-5 \times 2 & 1-5 \times (-1) \end{bmatrix} A$$

$$\Rightarrow \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ -10 & 6 \end{bmatrix} A$$

Applying $R_2 \rightarrow \frac{1}{2} R_2$, we get

$$\begin{bmatrix} 1 & 0 \\ \frac{1}{2} \times 0 & \frac{1}{2} \times 2 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ \frac{1}{2} \times (-10) & \frac{1}{2} \times 6 \end{bmatrix} A = \begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix} A$$

$$\Rightarrow \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix} A \Rightarrow A^{-1} = \begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix}$$

Ex 3.4 (M.C.G.R.T)

Question no-8 Find A^{-1} if $A = \begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$

Solution: Given that $A = \begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$
we write $A = IA$

$$\Rightarrow \begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} A$$

Applying $R_1 - R_2$, we get

$$\begin{bmatrix} 4-3 & 5-4 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 1 & 0 \end{bmatrix} A$$

$$\Rightarrow \begin{bmatrix} 1 & 1 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix} A$$

Applying $R_2 - 3R_1$, we get

$$\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & 1-3(-1) \end{bmatrix} A$$

$$\Rightarrow \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ -3 & 4 \end{bmatrix} A$$

Applying $R_1 - R_2$, we get

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1-(-3) & -1-4 \\ -3 & 4 \end{bmatrix} A$$

$$\Rightarrow \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 4 & -5 \\ -3 & 4 \end{bmatrix} A$$

Comparing with $I = A^{-1}A$, we get

$$A^{-1} = \begin{bmatrix} 4 & -5 \\ -3 & 4 \end{bmatrix}$$