Matrix

Elementery operation (Transformation) of a Matrix:-

i) For a Matrix:- we can interchange any 2 Rows or Columns.

i.e. $\rightarrow [R_i \leftrightarrow R_j$ or $C_i \leftrightarrow C_j]$

Ex:- $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \rightarrow R_1 \leftrightarrow R_2 \rightarrow A = \begin{bmatrix} 4 & 5 & 6 \\ 1 & 2 & 3 \\ 7 & 8 & 9 \end{bmatrix}$

OR

$A \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \rightarrow C_1 \leftrightarrow C_3 \rightarrow A = \begin{bmatrix} 3 & 2 & 1 \\ 6 & 5 & 4 \\ 9 & 8 & 7 \end{bmatrix}$

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Elementery operation (Transformation) of a Matrix :-

ii) $\boxed{R_i \longrightarrow kR_i}$ or $\boxed{C_i = KC_i}$

Ex:- $A = \begin{bmatrix} 1 & 3 & 7 \\ 0 & 5 & 2 \end{bmatrix} \Rightarrow R_2 \to 5R_2 \Rightarrow A = \begin{bmatrix} 1 & 3 & 7 \\ 0 & 25 & 10 \end{bmatrix}$

Ex:- $B = \begin{bmatrix} 1 & 7 \\ 4 & -3 \end{bmatrix} \Rightarrow C_1 \to \frac{1}{7}C_1 \Rightarrow B = \begin{bmatrix} 1/7 & 7 \\ 4/7 & -3 \end{bmatrix}$

Matrix

Elementery operation (Transformation) of a Matrix:-

iii) $[R_i \to R_i + KR_j]$ or $C_i \to C_i + KC_j$

Ex:- $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ $R_1 \to R_1 + 5R_2 \Rightarrow A = \begin{bmatrix} 21 & 27 & 33 \\ 4 & 5 & 6 \end{bmatrix}$

$B = \begin{bmatrix} 1 & 4 \\ 7 & 3 \end{bmatrix} \to \boxed{C_2 \to C_2 + \frac{1}{2}C_1} \Rightarrow B = \begin{bmatrix} 1 & 4+1/2 \\ 7 & 3+7/2 \end{bmatrix} = \begin{bmatrix} 1 & 9/2 \\ 7 & 13/2 \end{bmatrix}$

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Matrix

$A \cdot B$

Invertible Matrix :- for a sq. matrix A having order m. there is a another sq. matrix (B) having the same order m such that:-

$\Rightarrow$ $[A \cdot B = B \cdot A = I]$ then :- B is inverse of matrix A.

or A is inverse of matrix B.

i.e. $\boxed{A = B^{-1}}$ or $\boxed{B = A^{-1}}$

Ex:- $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}$

Now:- $A \cdot B = \begin{bmatrix} 4+(-3) & -6+6 \\ 2+(-2) & -3+4 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I$

$BA = \begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 4+(-3) & 6+(-6) \\ -2+2 & -3+4 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I$

Here $[AB = BA = I]$ it means

[A is inverse of B or B is inverse of A.] Ans