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## Rank of a Matrix

Important Points  $\Rightarrow$

Transformation of a Matrix (Elementary)

(I) By Interchange of any two rows or two columns of a matrix.

$$\Rightarrow C_{ij} \text{ or } R_{ij}$$

e.g.

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

Applying  $C_{12}$ ,  $A \sim \begin{bmatrix} 2 & 1 \\ 4 & 3 \\ 6 & 5 \end{bmatrix}$  ( $C_{12}$ )

$R_{23}$ ,  $A \sim \begin{bmatrix} 2 & 1 \\ 6 & 5 \\ 4 & 3 \end{bmatrix}$  ( $R_{23}$ )

(II) By Multiplication of all elements of any row or column by a non-zero number.

$$\Rightarrow K C_i \text{ or } C_i (K)$$

$$K R_i \text{ or } R_i (K)$$

e.g.

$$A = \begin{bmatrix} 3 & 5 \\ 4 & 6 \\ 7 & 8 \end{bmatrix}$$

Applying  $2C_1$ ,  $A \sim \begin{bmatrix} 6 & 5 \\ 8 & 6 \\ 14 & 8 \end{bmatrix}$  ( $2C_1$ )

and  $3R_3$ ,  $A \sim \begin{bmatrix} 3 & 5 \\ 4 & 6 \\ 21 & 24 \end{bmatrix}$  ( $3R_3$ )

(III) By Addition of all elements of a row or Column of a matrix, the same mul of the corresponding elements of any row or Column

$$\Rightarrow R_i + kR_j \text{ or } R_{ij}(k)$$

stands for addition of  $k$ -times the  $j$ th row of a matrix to the  $i$ th row.

Similarly,  $C_i + kC_j$  or  $C_{ij}(k)$

e.g.  $A = \begin{bmatrix} 3 & 5 \\ 4 & 6 \\ 7 & 9 \end{bmatrix}$

Applying,  $R_1 + 2R_2$

$$A \sim \begin{bmatrix} 11 & 17 \\ 4 & 6 \\ 7 & 9 \end{bmatrix}$$

and

$$C_1 + 3C_2,$$

$$A = \begin{bmatrix} 18 & 5 \\ 22 & 6 \\ 34 & 9 \end{bmatrix}$$

QWZ