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Transpose Matrix - In a Square matrix if we interchange corresponding row to corresponding column then new matrix formed by interchanging is called transpose of that Matrix:

Eg:

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

then 'A' tranpose is denoted by

$$A' = \begin{bmatrix} a_{11} & a_{21} & a_{31} \\ a_{12} & a_{22} & a_{32} \\ a_{13} & a_{23} & a_{33} \end{bmatrix}$$

Adjoint of a Square Matrix

Let $A = [a_{ij}]$ be any $n \times n$ matrix, then adjoint of A is defined as the tranpose of Matrix $[A_{ij}]_{n \times n}$ where A_n denotes the co-factor of the element a_{ij} in the determinant $|A|$. The adjoint of the matrix A is denoted by the Symbol adj (A)

$$\text{Let } A = \begin{bmatrix} A_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \text{ be}$$

a 3X3 matrix, then

Co-factor matrix or Cof(A) = ~~$[A_{11}\ A_{12}$~~

$$\text{Co-factor } A = \begin{bmatrix} A_{11} & A_{12} & A_{13} \\ A_{21} & A_{22} & A_{23} \\ A_{31} & A_{32} & A_{33} \end{bmatrix}$$

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$\therefore \operatorname{adj}(A) = [Co(A)]'$

$$= \begin{bmatrix} A_{11} & A_{21} & A_{31} \\ A_{12} & A_{22} & A_{32} \\ A_{13} & A_{23} & A_{33} \end{bmatrix}$$

Note. The product of a Matrix A and its adjoint is equal to unit matrix multiplied by the determinant A i.e

$$(\operatorname{adj} A) \cdot A = A(\operatorname{adj} A) = |A| \cdot I$$

Inverse of a Matrix – A square matrix A of Order n is said to be invertible, if $\exists$ a Square matrix B of order n, Such that $AB = BA = I$

B is called the inverse of A, we have $B = A^{-1}$. The inverse of A is Given by

$$A^{-1} = \frac{\operatorname{adj}(A)}{|A|} \quad \text{provided } |A| \neq 0$$