1.3 Matrices Arithmetic

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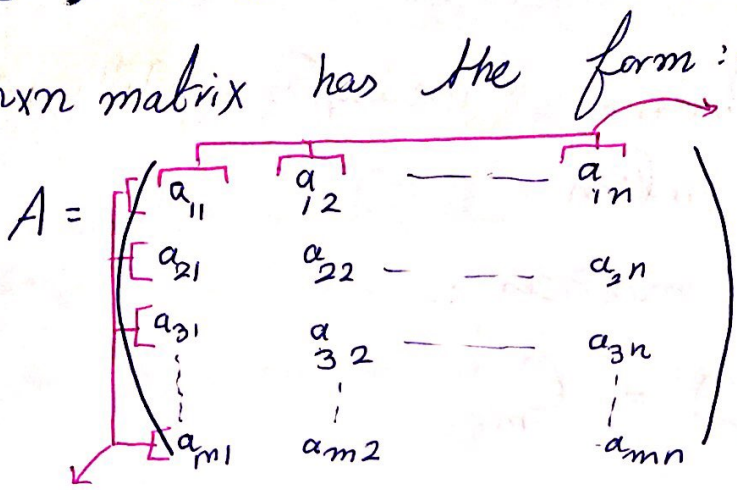
- mxn matrix has the form :-



first row : $\vec{a}_1$

second row: $\vec{a}_2$

mth row : $\vec{a}_m$

first column a_1

second column a_2

nth column a_n

m : number of Rows

n : number of columns

→ Each Element in the matrix has a notation :-

a_{ij} (row → i, column ← j)

And the matrix :- $A = (a_{ij})_{m \times n}$

operations on Matrices

1) Equality :-

$A = B$ if :- $a_{ij} = b_{ij}$ and size is equal

2) Addition :- To Adel matrices, sizes should be the same.

$A \pm B = C_{m \times n}$

↵ جمع كل عنصر بالعنصر الذي تقابله (المواقع المتشابهة)

3) Scalar Multiplication

α is a scalar :-

$\alpha A = \alpha (a_{ij})_{m \times n}$ تضرب الثابت بكل عنصر

4) Matrix Multiplication :-

To multiply 2 matrices :-

$(A_{m \times n})(B_{n \times r}) = C_{m r}$

Should Be the same

Ex $\begin{pmatrix} 1 & 2 & 3 \\ 1 & -1 & 2 \end{pmatrix}_{2 \times 3} \times \begin{pmatrix} 4 & 0 \\ 2 & 1 \\ 1 & -1 \end{pmatrix}_{3 \times 2}$

$= 1 \times 4 + 2 \times 2 + 3 \times 1 = 11$

$= 0 + 2 \times 1 + 3 \times -1 = -1$

$= 1 \times 4 - 1 \times 2 + 2 \times 1 = 4$

$= 0 + -1 \times 1 - 2 = -3$

$C_{2 \times 2} = \begin{pmatrix} 11 & -1 \\ 4 & 3 \end{pmatrix}$

Note!

$AB \neq BA$

5) Transpose of A matrix :- If $A = (a_{ij})_{m \times n}$

$\hookrightarrow A^T = C_{n \times m}$, $c_{ij} = a_{ji}$

Ex $\begin{pmatrix} 1 & 2 & -1 \\ 2 & 4 & 5 \end{pmatrix} \rightsquigarrow$ Transpose $= \begin{pmatrix} 1 & 2 \\ 2 & 4 \\ -1 & 5 \end{pmatrix}$

Symmetry of Matrices $A = (a_{ij})_{n \times n}$

- A is symmetric if $A^T = A$
- A is skew-symmetric if $A^T = -A$ (Main diagonal Should be all zeros (0))