

المصفوفات

Def (order of matrix)

صباح الخير
→ 😊

Exp

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2 \times 2}$$

A of order 2×2
 عدد الصفوف rows
 عدد الأعمدة Columns

$$B = \begin{bmatrix} 1 & 3 & 0 \\ 2 & 4 & -5 \end{bmatrix}_{2 \times 3}$$

$$C = \begin{bmatrix} 6 \\ 1 \\ 0 \end{bmatrix}_{3 \times 1}$$

$$D = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & -2 \\ 5 & 7 & 9 \end{bmatrix}_{3 \times 3}$$

$$E = \begin{bmatrix} 0 & 1 \end{bmatrix}_{1 \times 2}$$

Def (Square Matrix) $\Rightarrow m = n$
 المصفوفة المربعة

Def (Square matrix) $\rightarrow$ $\begin{matrix} \text{عدد الأعمدة} \\ \text{عدد الصفوف} \end{matrix}$

square matrice in Exp are A, D

Not square " " " " B, C, E

Def The negative of A is $-A$

Exp $A = \begin{bmatrix} -1 & 2 & -3 \\ 0 & -5 & 4 \end{bmatrix} \Rightarrow -A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & 5 & -4 \end{bmatrix}$

$-B = \begin{bmatrix} 4 & -8 & 10 \\ -1 & 3 & \sqrt{2} \\ 7 & 0 & -\sqrt{3} \end{bmatrix} \Rightarrow B = \begin{bmatrix} -4 & 8 & -10 \\ 1 & -3 & -\sqrt{2} \\ -7 & 0 & \sqrt{3} \end{bmatrix}$

Def Entries or Elements
المداخل العناصر

$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$

المدخل الموجود في الصف الثاني والعمود الأول من المصفوفة A

" " " " الثاني = الأول = " " " " الثاني = الأول = " " " " الثاني = الأول =

a_{12}
 b_{22}

$B = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \end{bmatrix}$

$$B = \dots$$

$$B = \begin{bmatrix} b_{21} & b_{22} & b_{23} \end{bmatrix}$$

$$\underline{\underline{\text{Exp}}} \quad A = \begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix}, \quad B = \begin{bmatrix} -2 & 0 & 5 \\ -1 & -1 & 8 \end{bmatrix}$$

$$a_{12} = 2, \quad b_{21} = -1, \quad a_{22} = -4, \quad b_{23} = 8$$

$$a_{21} = 3, \quad b_{22} = -1, \quad a_{13} = \text{none}, \quad b_{32} = \text{none}$$

def **Transpose** of A is A^T
المنقلب يعني عكس

$$\underline{\underline{\text{Exp}}} \quad A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \Rightarrow A^T = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$$

$$(A^T)^T = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = A$$

$$\underline{\underline{(B^T)^T = B}}$$

Exp

$$C = \begin{bmatrix} 1 & 0 & 10 \\ 0 & -2 & \sqrt{5} \end{bmatrix}$$

2x3

$$C^T = \begin{bmatrix} 1 & 0 \\ 0 & -2 \\ 10 & \sqrt{5} \end{bmatrix}$$

2×3

3×2

If $A_{m \times n}$ then $A^T_{n \times m}$

Def • Any matrix with one row is called row matrix or (row vector)

Exp $A = [-1 \ 0 \ 5]$ is row matrix

$$B = [-2 \ -3] \quad = \quad = \quad =$$

• Any matrix with one column is called column matrix or (column vector)

Exp $E = \begin{bmatrix} 10 \\ 11 \\ 15 \end{bmatrix}$ is column matrix

$$D = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \quad = \quad = \quad =$$

()

Def **Zero matrix** is matrix with zero entries

Exp $A = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ is 2×2 zero matrix

$C = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ is 3×3 = =

$D = \begin{bmatrix} 0 & 0 & 0 & 0 \end{bmatrix}$ is 1×4 row zero matrix

Def Q. When matrix A equal matrix B?

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2 \times 2} \neq \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}_{2 \times 2}$$

Answer if • A and B have same order and the corresponding entries are equal

Exp $A = \begin{bmatrix} 0 & 1 \\ 3 & -2 \end{bmatrix}_{2 \times 2}, B = \begin{bmatrix} 0 & 1 \\ 3 & -2 \end{bmatrix}_{2 \times 2}$

$A = B$

$$A = B$$



Ex If $\begin{bmatrix} 2t-1 & 9 \\ \sqrt{y} & 5 \end{bmatrix} = \begin{bmatrix} 3 & x^2 \\ 2 & z+1 \end{bmatrix}$ then

Find x, t, y, z

- $x^2 = 9 \Rightarrow \sqrt{x^2} = \sqrt{9} \Rightarrow |x| = 3 \Rightarrow \boxed{x = \pm 3}$
- $2t-1 = 3 \Rightarrow 2t = 4 \Rightarrow \boxed{t = 2}$
- $\sqrt{y} = 2 \Rightarrow \boxed{y = 4}$
- $z+1 = 5 \Rightarrow \boxed{z = 4}$

Q. How to add A and B?
How to subtract A from B?

b.

Order of A = order of B
ہر یکویں الجح، الجح

Let $A = \begin{bmatrix} 1 & 3 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 5 & 6 \\ 0 & -2 \end{bmatrix}$

Exp $A = \begin{bmatrix} 1 & 3 & 4 \\ 2 & 0 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 5 & 6 \\ 0 & -2 \\ 3 & 4 \end{bmatrix}$

$C = \begin{bmatrix} 0 & 0 & 2 \\ 1 & -1 & 3 \end{bmatrix}$

① $A + C = \begin{bmatrix} 1 & 3 & 4 \\ 2 & 0 & -1 \end{bmatrix} + \begin{bmatrix} 0 & 0 & 2 \\ 1 & -1 & 3 \end{bmatrix}$

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

② $B + C$ not possible

$B = \begin{bmatrix} 5 & 6 \\ 0 & -2 \\ 3 & 4 \end{bmatrix}$ 3×2

$C = \begin{bmatrix} 0 & 0 & 2 \\ 1 & -1 & 3 \end{bmatrix}$ 2×3

Scalar c multiple of matrix A

$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \Rightarrow cA = \begin{bmatrix} ca_{11} & ca_{12} \\ ca_{21} & ca_{22} \end{bmatrix}$

Exp $A = \begin{bmatrix} 1 & 2 \\ \frac{1}{2} & 3 \end{bmatrix}$, $C = \begin{bmatrix} 1 \\ 3 \\ \frac{5}{2} \end{bmatrix}$

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

③ $-3A^T$

$-4 \left(\frac{5}{2} \right) = -\frac{20}{2} = -10$

$= \begin{bmatrix} -4 \\ -12 \\ -10 \end{bmatrix}$

$= -3 \begin{bmatrix} 1 & 2 \\ \frac{1}{2} & 3 \end{bmatrix}^T = -3 \begin{bmatrix} 1 & \frac{1}{2} \\ 2 & 3 \end{bmatrix}$

$= \begin{bmatrix} -3 & -\frac{3}{2} \\ -6 & -9 \end{bmatrix}$

③ give **zero matrix** with same order as C

Z $= \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

zero matrix of order 3×2

Exp Give zero matrix of order 3×2

$$Z = \begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$$

Exp $A = \begin{bmatrix} 1 & 0 & -1 \\ 2 & -1 & 2 \\ 3 & -5 & 7 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 & 8 \\ -1 & -3 & 0 \\ 4 & 5 & -2 \end{bmatrix}$

$$A^T + B^T = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & -5 \\ -1 & 2 & 7 \end{bmatrix} + \begin{bmatrix} 0 & -1 & 4 \\ 1 & -3 & 5 \\ 8 & 0 & -2 \end{bmatrix}$$

$$= \begin{bmatrix} 1+0 & 2+(-1) & 3+4 \\ 0+1 & -1+(-3) & -5+5 \\ -1+8 & 2+0 & 7+(-2) \end{bmatrix} = \begin{bmatrix} 1 & 1 & 7 \\ 1 & -4 & 0 \\ 7 & 2 & 5 \end{bmatrix}$$

Exp $C = \begin{bmatrix} 0 \\ -1 \\ 4 \end{bmatrix}_{3 \times 1}$ find $C^T = \begin{bmatrix} 0 & -1 & 4 \end{bmatrix}_{1 \times 3}$

Exp sketch $y = |x+1| - 2$

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