



Algebra of Matrices Ex 5.1 Q1

We know that if a matrix is of the order $m \times n$, it has mn elements. Thus, to find all the possible orders of a matrix having 8 elements, we have to find all the ordered pairs of natural numbers whose products is 8.

The ordered pairs are: (1×8) , (8×1) , (2×4) , (4×2)

$(1, 5)$ and $(5, 1)$ are the ordered pairs of natural numbers whose product is 5.

Hence, the possible orders of a matrix having 5 elements are 1×5 and 5×1

Algebra of Matrices Ex 5.1 Q2

$$\text{If } A = [a_{ij}] = \begin{bmatrix} 2 & 3 & -5 \\ 1 & 4 & 9 \\ 0 & 7 & -2 \end{bmatrix} \text{ and } B = [b_{ij}] = \begin{bmatrix} 2 & -1 \\ -3 & 4 \\ 1 & 2 \end{bmatrix}$$

$$(i) \quad a_{22} + b_{21} = 4 + (-3) = 1$$

$$\text{Hence, } a_{22} + b_{21} = 1$$

$$(ii) \quad a_{11} b_{11} + a_{22} b_{22} = (2)(2) + (4)(4) = 4 + 16 = 20$$

Hence,

$$a_{11} b_{11} + a_{22} b_{22} = 20$$

Algebra of Matrices Ex 5.1 Q3

Here, $A = [a_{ij}]_{3 \times 4}$

R_1 = first row of $A = [a_{11} a_{12} a_{13} a_{14}]_{1 \times 4}$

So, order of $R_1 = 1 \times 4$

C_2 = Second column of A

$$= \begin{bmatrix} a_{12} \\ a_{22} \\ a_{32} \end{bmatrix}_{3 \times 1}$$

Order of $C_2 = 3 \times 1$

Algebra of Matrices Ex 5.1 Q4

Let $A = (a_{ij})_{2 \times 3}$

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{bmatrix} \quad \dots (i)$$

(i) $a_{ij} = i \cdot j$

$$a_{11} = 1 \cdot 1 = 1, \quad a_{12} = 1 \cdot 2 = 2, \quad a_{13} = 1 \cdot 3 = 3$$

$$a_{21} = 2 \cdot 1 = 2, \quad a_{22} = 2 \cdot 2 = 4, \quad a_{23} = 2 \cdot 3 = 6$$

So, using equation (i)

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

(ii) $a_{ij} = 2i - j$

$$a_{11} = 2(1) - 1 = 1, \quad a_{12} = 2(1) - 2 = 0, \quad a_{13} = 2(1) - 3 = -1$$

$$a_{21} = 2(2) - 1 = 3, \quad a_{22} = 2(2) - 2 = 2, \quad a_{23} = 2(2) - 3 = 1$$

Using equation (i)

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

$$(iii) \quad a_{ij} = i + j$$

$$a_{11} = 1 + 1 = 2, \quad a_{12} = 1 + 2 = 3, \quad a_{13} = 1 + 3 = 4$$

$$a_{21} = 2 + 1 = 3, \quad a_{22} = 2 + 2 = 4, \quad a_{23} = 2 + 3 = 5$$

Using equation (i)

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

$$(iv) \quad a_{ij} = \frac{(i + j)^2}{2}$$

$$a_{11} = \frac{(1+1)^2}{2} = 1, \quad a_{12} = \frac{(1+2)^2}{2} = \frac{9}{2}, \quad a_{13} = \frac{(1+3)^2}{2} = 8$$

$$a_{21} = \frac{(2+1)^2}{2} = \frac{9}{2}, \quad a_{22} = \frac{(2+2)^2}{2} = 8, \quad a_{23} = \frac{(2+3)^2}{2} = \frac{25}{2}$$

Using equation (i),

$$A = \begin{bmatrix} 1 & \frac{9}{2} & 8 \\ \frac{9}{2} & 8 & \frac{25}{2} \end{bmatrix}$$

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