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: $(1 \times 8), (8 \times 1), (2 \times 4), (4 \times 2)$

$(1,5)$ *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

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

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

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

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

Hence,

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

Algebra of Matrices Ex 5.1 Q3

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

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

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

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

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

$a_{11} = 1.1 = 1,\ a_{12} = 1.2 = 2,\ a_{13} = 1.3 = 3$

$a_{21} = 2.1 = 2,\ a_{22} = 2.2 = 4,\ a_{23} = 2.3 = 6$

So, using equation (i)

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

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

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

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

Using equation (i)

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

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

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

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

Using equation (i)

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

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

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

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

Using equation (i),

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

********** END **********