Class XII Matrix Ex-3.1 06-07-2020

Q.5 (ii) Here, $\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \end{bmatrix}_{3\times4}$, where $a_{ij} = 2i - j$

$\because a_{ij} = 2i - j$

$\therefore a_{11} = 2\times1 - 1 = 2-1 = 1$, $a_{12} = 2\times1 - 2 = 2-2 = 0$

$a_{13} = 2\times1 - 3 = 2-3 = -1$, $a_{14} = 2\times1 - 4 = 2-4 = -2$

$a_{21} = 2\times2 - 1 = 4-1 = 3$, $a_{22} = 2\times2 - 2 = 4-2 = 2$

$a_{23} = 2\times2 - 3 = 4-3 = 1$, $a_{24} = 2\times2 - 4 = 4-4 = 0$

$a_{31} = 2\times3 - 1 = 6-1 = 5$, $a_{32} = 2\times3 - 2 = 6-2 = 4$

$a_{33} = 2\times3 - 3 = 6-3 = 3$, $a_{34} = 2\times3 - 4 = 6-4 = 2$

$\therefore A = \begin{bmatrix} 1 & 0 & -1 & -2 \\ 3 & 2 & 1 & 0 \\ 5 & 4 & 3 & 2 \end{bmatrix}_{3\times4}$

Q6. Find the values of x, y and z from the following eqns.

(I) $\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix}$ (II) $\begin{bmatrix} x+y & 2 \\ 5+z & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$

(III) $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$

Soln: (I) Given, $\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix}$

$\therefore y = 4$, $z = 3$, $x = 1$

$\Rightarrow x = 1$, $y = 4$ and $z = 3$

(II) $\begin{bmatrix} x+y & 2 \\ 5+z & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$

$\Rightarrow x + y = 6$, $5 + z = 5$, $xy = 8$

$\Rightarrow z = 0$. $\Rightarrow y = \frac{8}{x}$

$\Rightarrow \frac{x}{1} + \frac{8}{x} = 6$

$\Rightarrow \frac{x^2 + 8}{x} = \frac{6}{1}$

$\Rightarrow x^2 + 8 = 6x$

$\Rightarrow x^2 - 6x + 8 = 0 \Rightarrow x^2 - 4x - 2x + 8 = 0 \Rightarrow x(x-4) - 2(x-4) = 0$

$\Rightarrow (x-2)(x-4) = 0$

$\Rightarrow x - 2 = 0$ or $x - 4 = 0$

$\Rightarrow x = 2$ or $x = 4$

Class-XII Matrix Ex 3.1 06-07-2020

When $x=4$, $y=\frac{8}{4}=2$

When $x=2$, $y=\frac{8}{2}=4$

$\therefore$ $x=4$, $y=2$ and $z=0$

(iii) $$\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$$

$\therefore$ $x+y+z=9$ — I, $x+z=5$ — II, $y+z=7$ — III

II − I, $\cancel{x}+\cancel{z}-\cancel{x}-y-\cancel{z}=5-9$

$-y=-4$

$\Rightarrow y=4$

I − III, $x+\cancel{y}+\cancel{z}=\cancel{y}\cancel{z}=9-7$

$\Rightarrow x=2$

When $y=4$ in III, $4+z=7 \Rightarrow z=7-4=3$

Hence, $x=2$, $y=4$, $z=3$ Ans

Q.7. Find the values of a, b, c and d from the equation

$$\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$$

Soln.
$$\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$$

$\Rightarrow$ $a-b=-1$ — I $\quad 2a+c=5$ — III

$2a-b=0$ — II $\quad 3c+d=13$ — IV

$\therefore$ II − I, $2a-\cancel{b}-a+\cancel{b}=0-(-1)=1$

$\Rightarrow a=1$

Putting $a=1$ in eqn I and eqn III, we get

$1-b=-1$ and $2+c=5$

$\Rightarrow b=-1-1=-2$ and $c=5-2=3$

Subtracting $c=3$ in eqn IV

$3\times3+d=13 \Rightarrow d=13-9=4$

Hence, $a=1$, $b=2$, $c=3$ and $d=4$

Q.8. $A=[a_{ij}]_{m\times n}$ is an square matrix, if

(a) $m<n$ (b) $m>n$ (c) $m=n$ (d) none of these.

Soln: Since, in a square matrix, the no. of rows is equal to the number of columns, therefore, we must have $m=n$.

$\therefore$ $A=[a_{ij}]_{m\times m}$. So, correct option is (c) Ans

Q.9. Which of the given values of ~~and~~ x and y make the following pairs of matrices equal

$$\begin{bmatrix} 3x+7 & 8 \\ y+1 & 2-3x \end{bmatrix}, \begin{bmatrix} 0 & y-2 \\ 8 & 4 \end{bmatrix} = ?$$

Soln: According to the question,

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

$\therefore$ $3x+7=0$ — (I) $5=y-2$ — (II)

$y+1=8$ — (III) $2-3x=4$ — (IV)

From eqn (II); $y=5+2=7$, From eqn I, $3x+7=0 \Rightarrow 3x=-7$ $\Rightarrow x=-\frac{7}{3}$

From eqn (IV), $2-3x=4 \Rightarrow 3x=~~2~~-6$ $\Rightarrow x=~~\frac{6}{3}~~-\frac{2}{3}$ A

Since, x can have only one value at a time ~~[illegible]~~

Hence, it is not possible to find x and y

So, correct option is (b)

Q.10. The number of all possible matrices of order 3×3 with each entry 0 to 1 is

Soln: As order of 3×3 matrix contains 9 elements. Each element can be selected in 2 ways [99 can be either 0 or 1]

Hence, ~~all~~ all the nine entries can be chosen in $2^9=512$ ways.

The required no. of matrices $=512$. Correct option is (d) Ans

Class-XII **Matrix** Ex 3.5 Date – 06-07-2020

(6) Adjoint of a matrix: → Let A be a square matrix of order n and let C_{ij} denotes the co-factor of the element a_{ij} in [A], then we define:

$$(\text{adj} A) = \begin{bmatrix} C_{11} & C_{12} & C_{13} & \cdots & C_{1n} \\ C_{21} & C_{22} & C_{23} & \cdots & C_{2n} \\ \vdots \\ C_{n1} & C_{n2} & C_{n3} & \cdots & C_{nn} \end{bmatrix}'$$

$$\Rightarrow (\text{adj} A) = \begin{bmatrix} C_{11} & C_{21} & \cdots & C_{n1} \\ C_{12} & C_{22} & \cdots & C_{n2} \\ \cdots & \cdots & \cdots & \cdots \\ C_{1n} & C_{2n} & \cdots & C_{nn} \end{bmatrix}$$

(7) Properties of adjoint of a matrix

(I) $\text{adj}(AB) = \text{adj} A \cdot \text{adj} B$

(II) $A(\text{adj} A) = (\text{adj} A)A = |A| I$, where I is the identity matrix of order n.

(III) $|\text{adj} A| = |A|^{n-1}$, where A is a non-singular matrix of order n.

(8) Inverse of a matrix

(I) A^{-1} exists only when $|A| \neq 0$, A is non-singular

(II) $A^{-1} = \frac{1}{|A|}(\text{adj} A)$

(9) Properties of inverse

(I) $AA^{-1} = A^{-1}A = I$ (II) $(AB)^{-1} = B^{-1}A^{-1}$ (III) $(A^{-1})^{-1} = A$

(IV) $|A^{-1}| = \frac{1}{|A|}$ (V) $(A')^{-1} = (A^{-1})'$ or $(A^T)^{-1} = (A^{-1})^T$

where A' or A^T is transpose of a matrix A.

(10) (I) Symmetric Matrix: → A square matrix A is called symmetric, if $A' = A$

(II) Skew-Symmetric matrix: → A square matrix A is called skew-symmetric if $A' = -A$.