PARISHRAM 2026

Mathematics

Determinants

DPP: 6

Q1 If A is a square matrix of order 3 such that the value of | adj A | = 8, then the value of $|A^T|$ is

(A) $\sqrt{2}$ (B) $-\sqrt{2}$

(C) 8 (D) $2\sqrt{2}$

Q2 For the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ \lambda & 2 & 0 \\ 1 & -2 & 3 \end{bmatrix}$ to be invertible, the value of λ is

(A) 0

(B) 10

(C) R – {10}

(D) R – {–10}

Q3 If a_{ij} and A_{ij} represent the $(ij)^{th}$ element and its cofactor of $\begin{bmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{bmatrix}$ respectively, then the value of $a_{11} A_{21} + a_{12} A_{22} + a_{13} A_{23}$ is

(A) 0 (B) –28

(C) 114 (D) –114

Q4 If A and B are two square matrices of order 2 and |A| = 2 and |B| = 5 , then |–3 AB| is

(A) –90 (B) –30

(C) 30 (D) 90

Q5 If $A = \begin{bmatrix} 0 & 1 & -1 \\ 1 & 2 & 1 \\ 0 & 3 & -2 \end{bmatrix}$, then the value of |A adj(A)| is

(A) –1 (B) 1

(C) 2 (D) 3

Q6 If the area of the triangle with vertices (–3, 0), (3,0) and (0, k) is 9 sq units, then the value(s) of k will be

(A) 9 (B) ± 3

(C) –9 (D) 6

Q7 Find k for which system

kx – y + 2z = 3

x + 2y – 3z = 7

3x + 4y – 9z = 1

is having unique solution

(A) $k = \frac{1}{3}$ (B) $k = \frac{2}{3}$

(C) $k \neq \frac{-2}{3}$ (D) $k \neq \frac{-1}{3}$

Q8 If A is singular matrix and (adj A) B ≠ O, then

(A) there is unique solution

(B) solution does not exist

(C) there are infinitely many solutions

(D) None of these

Q9 Gautam buys 5 pens, 3 bags and 1 instrument box and pays a sum of ₹160. From the same shop Vikram buys 2 pens, 1 bag and 3 instrument boxes and pays a sum of ₹190. Also Ankur buys 1 pen, 2 bags and 4 instrument boxes and pays a sum of ₹250.

After converting the given above situation into a matrix equation of the form AX = B tell which option represents AX = B?

(A) $\begin{bmatrix} 5 & 3 & 1 \\ 2 & 1 & 3 \\ 1 & 2 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 250 \\ 190 \\ 160 \end{bmatrix}$

(B) $\begin{bmatrix} 5 & 3 & 1 \\ 2 & 1 & 3 \\ 1 & 2 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 160 \\ 190 \\ 250 \end{bmatrix}$

(C) $\begin{bmatrix} 5 & 3 & 1 \\ 2 & 1 & 3 \\ 1 & 2 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 190 \\ 250 \\ 160 \end{bmatrix}$

(D) $\begin{bmatrix} 5 & 3 & 1 \\ 2 & 1 & 3 \\ 1 & 2 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 250 \\ 160 \\ 190 \end{bmatrix}$

Q10

If inverse of matrix $\begin{bmatrix} 7 & -3 & -3 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$ is the matrix $\begin{bmatrix} 1 & 3 & 3 \\ 1 & \lambda & 3 \\ 1 & 3 & 4 \end{bmatrix}$, then value of λ is

(A) –4 (B) 1

(C) 3 (D) 4

Answer Key

Q1	D
Q2	D
Q3	A
Q4	D
Q5	A
Q6	B
Q7	C
Q8	B
Q9	B
Q10	D

Q1 Text Solution:

$|adj.A| = |A|^{3-1} = 8$

$|A|^2 = 8 \quad |A| = |A^T| = \pm 2\sqrt{2}.$

Video Solution:

Q2 Text Solution:

Clearly, $|A| = \begin{vmatrix} 2 & -1 & 1 \\ \lambda & 2 & 0 \\ 1 & -2 & 3 \end{vmatrix} \neq 0$

(if A is invertible matrix, $|A| \neq 0$)

$2(6) + 1(3\lambda) + 1(-2\lambda - 2) \neq 0$

$12 + \lambda - 2 \neq 0 \quad \lambda \neq -10$

Therefore, $\lambda \quad R - \{-10\}$.

Video Solution:

Q3 Text Solution:

Note that, the elements are of first row and the cofactors are of elements of second row.

So, $a_{11} A_{21} + a_{12} A_{22} + a_{13} A_{23} = 0$.

($\because$If elements of a row (or column) are multiplied with cofactors of any other row (or column), then their sum is zero.)

Video Solution:

Q4 Text Solution:

$|-3\,AB| = (-3)^2\,|AB| = 9|A|\,|B| = 9 \times 2 \times 5 = 90$

Video Solution:

Q5 Text Solution:

$|A| = \begin{vmatrix} 0 & 1 & -1 \\ 1 & 2 & 1 \\ 0 & 3 & -2 \end{vmatrix} = 0 - 1\left(-2 + 3\right) + 0 = -1$

Now,

$|A\,adj(A)| = |A|\,|adj(A)| = |A||A|^{3-1}$

$= |A|^3 = (-1)^3 = -1.$

Video Solution:

Q6 Text Solution:

$\text{Area} = \left|\frac{1}{2}\begin{vmatrix} -3 & 0 & 1 \\ 3 & 0 & 1 \\ 0 & k & 1 \end{vmatrix}\right|$, given that the area = 9 sq unit.

$\Rightarrow \pm 9 = \frac{1}{2}\begin{vmatrix} -3 & 0 & 1 \\ 3 & 0 & 1 \\ 0 & k & 1 \end{vmatrix}$; expanding along C_2, we get $k = \pm 3$.

Video Solution:

Q7 Text Solution:

As the given system of equations has unique solution

$$\therefore \begin{vmatrix} k & -1 & 2 \\ 1 & 2 & -3 \\ 3 & 4 & -9 \end{vmatrix} \neq 0$$

$$\Rightarrow k(-18+12) - 1(-9+9) + 2(4-6) \neq 0$$

$$\Rightarrow -6k - 4 \neq 0$$

$$\Rightarrow k \neq -\frac{2}{3}$$

Video Solution:

Q8 Text Solution:

If $|A| = 0$ and $(\text{adj } A)B \neq O$, then system of equations has no solution.

Video Solution:

Q9 Text Solution:

Let the cost of each pen. each bag and each instrument box be x, y and z respectively.

According to question, we have

$5x + 3y + z = 160$ .... (i)

$2x + y + 3z = 190$ ....(ii)

$x + 2y + 4z = 250$ ...(iii)

$$\Rightarrow \begin{bmatrix} 5 & 3 & 1 \\ 2 & 1 & 3 \\ 1 & 2 & 4 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 160 \\ 190 \\ 250 \end{bmatrix}$$

I.e., $AX = B$

Video Solution:

Q10 Text Solution:

Since $A A^{-1} = I$

So, $7(3) + (-3)\lambda + (-3)3 = 0$ (since element $a_{12} = 0$ in I)

$\Rightarrow 3[7 + (-1)\lambda + (-3)] = 0$

$\Rightarrow \lambda = 4$

Video Solution: