



Maple Online Classes
A-25 DLF Loni Ghaziabad UP 201301

TEST PAPER: MATRICES & DETERMINANTS
Class 12 - Mathematics

Time Allowed: 2 hours

Maximum Marks: 60

Section A

1. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 & 3 \\ -1 & 0 & 2 \end{bmatrix}$ then find $2A - B$. **[1]**

2. Find values of x for which $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$. **[1]**

3. Evaluate: $\begin{vmatrix} \cos \alpha \cos \beta & \cos \alpha \sin \beta & -\sin \alpha \\ -\sin \beta & \cos \beta & 0 \\ \sin \alpha \cos \beta & \sin \alpha \sin \beta & \cos \alpha \end{vmatrix}$ **[1]**

4. If $A = \begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is such that $A^2 = I$, then **[1]**
 - a) $1 - \alpha^2 - \beta\gamma = 0$
 - b) $1 - \alpha^2 + \beta\gamma = 0$
 - c) $1 + \alpha^2 - \beta\gamma = 0$
 - d) $1 + \alpha^2 + \beta\gamma = 0$

5. If A is square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to **[1]**
 - a) $3A$
 - b) $I - A$

c) A

d) I

6. Let $A = \begin{bmatrix} 1 & \sin \theta & 1 \\ -\sin \theta & 1 & \sin \theta \\ -1 & -\sin \theta & 1 \end{bmatrix}$ where $0 \leq \theta \leq 2\pi$. Then **[1]**

a) $\text{Det}(A) = 0$

b) $\text{Det}(A) \in [2, 4]$

c) $\text{Det}(A) \in (2, 4)$

d) $\text{Det}(A) \in (2, \infty)$

7. Matrices A and B will be inverse of each other only if **[1]**

a) $AB = 0, BA = I$

b) $AB = BA = I$

c) $AB = BA = 0$

d) $AB = BA$

8. Find value of k if area of triangle is 4 sq. units and vertices are $(k, 0), (4, 0), (0, 2)$. **[1]**

9. Find the transpose of the matrix: $\begin{bmatrix} -1 & 5 & 6 \\ \sqrt{3} & 5 & 6 \\ 2 & 3 & -1 \end{bmatrix}$ **[1]**

10. Find adjoint of the matrix $\begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix}$ **[1]**

Section B

11. Find the values of x , y , and z from the following equation: [2]

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

12. If $A = \begin{bmatrix} \frac{2}{3} & 1 & \frac{5}{3} \\ \frac{1}{3} & \frac{2}{3} & \frac{4}{3} \\ \frac{7}{3} & 2 & \frac{2}{3} \end{bmatrix}$ and $B = \begin{bmatrix} \frac{2}{5} & \frac{3}{5} & 1 \\ \frac{1}{5} & \frac{2}{5} & \frac{4}{5} \\ \frac{7}{5} & \frac{6}{5} & \frac{2}{5} \end{bmatrix}$, then compute $3A - 5B$. [2]

13. Find the equation of line joining $(1, 2)$ and $(3, 6)$ using determinants. [2]

14. Using cofactors of elements of third column, evaluate $\Delta = \begin{vmatrix} 1 & x & yz \\ 1 & y & zx \\ 1 & z & xy \end{vmatrix}$ [2]

15. Let $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ 1 & 1 & 5 \end{bmatrix}$. verify that $[\text{adj } A]^{-1} = \text{adj } (A^{-1})$ [2]

Section C

16. Two farmers Ramkishan and Gurcharan Singh cultivates only three varieties of rice namely Basmati, Permal and Naura. The sale (in Rupees) of these varieties of rice by both the farmers [3]

in the month of September and October are given by the following matrices A and B.

$$A = \begin{array}{c} \text{September Sales (in Rupees)} \\ \begin{array}{ccc} \text{Basmati} & \text{Permal} & \text{Naura} \\ \left[\begin{array}{ccc} 10,000 & 20,000 & 30,000 \\ 50,000 & 30,000 & 10,000 \end{array} \right] \end{array} \begin{array}{l} \text{Ramkishan} \\ \text{Gurcharan Singh} \end{array} \end{array}$$

$$B = \begin{array}{c} \text{October Sales (in Rupees)} \\ \begin{array}{ccc} \text{Basmati} & \text{Permal} & \text{Naura} \\ \left[\begin{array}{ccc} 5000 & 10,000 & 6000 \\ 20,000 & 10,000 & 10,000 \end{array} \right] \end{array} \begin{array}{l} \text{Ramkishan} \\ \text{Gurcharan Singh} \end{array} \end{array}$$

- i. Find the combined sales in September and October for each farmer in each variety.
- ii. Find the decrease in sales from September to October.
- iii. If both farmers receive 2% profit on gross sales, compute the profit for each farmer and for each variety sold in October.

17. Prove that the determinant $\begin{vmatrix} x & \sin \theta & \cos \theta \\ -\sin \theta & -x & 1 \\ \cos \theta & 1 & x \end{vmatrix}$ is independent of θ . **[3]**

18. If $A^{-1} = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ find $(AB)^{-1}$ **[3]**

19. Solve the system of linear equation, using matrix method $4x - 3y = 3$; $3x - 5y = 7$ **[3]**

20. The bookshop of a particular school has 10 dozen chemistry books, 8 dozen physics books, 10 dozen economics books. Their selling prices are Rs 80, Rs 60 and Rs 40 each respectively. Find the total amount the bookshop will receive from selling all the books using matrix algebra. **[3]**

Section D

21. Express the matrix $B = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix. **[5]**
22. Solve the system of linear equation, using matrix method $2x + 3y + 3z = 5$; $x - 2y + z = -4$; $3x - y - 2z = 3$ **[5]**
23. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ show that $A^2 - 5A + 7I = 0$. **[5]**
24. For the matrix $A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$, find the numbers a and b such that $A^2 + aA + bI = 0$. **[5]**
25. Find the area of the triangle with vertices at the points given $(-2, -3)$, $(3, 2)$ and $(-1, -8)$. **[5]**