# MATHS

## BOOKS - CBSE COMPLEMENTARY MATERIAL MATHS (HINGLISH)

## MATRICES AND DETERMINANTS

### One Mark Questions

**1.** If $\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 0 & 5 & 1 \\ 0 & 3 & 2 \end{bmatrix} \begin{bmatrix} x \\ 1 \\ -2 \end{bmatrix} = [0]$ then x is

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**2.** If the matrix $\begin{bmatrix} 1 & 3 & \lambda + 2 \\ 2 & 4 & 8 \\ 3 & 5 & 10 \end{bmatrix}$ is singular then lamda= (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R

is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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**3.** If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{bmatrix}$, then $A^2$ is equal to

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**4.** If $A = [(a, b), (b, a0]$ and $A^2 = [(\alpha, \beta 0, (\beta, \alpha)]$ then (A) $\alpha = a^2 + b^2, \beta = ab$ (B) $\alpha = a^2 + b^2, \beta = 2ab$ (C) $\alpha = a^2 + b^2, \beta = a^2 - b^2$ (D) $\alpha = 2ab, \beta = a^2 + b^2$

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**5.** If $A$ is a square matrix such that $A^2 = I$, then find the simplified value of $(A - I)^3 + (A + I)^3 - 7A$.

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**6.** Write the value of $\begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ -3 & -3 & -3 \end{vmatrix}$

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**7.** If $\begin{bmatrix} x-y & z \\ 2x-y & w \end{bmatrix} = \begin{bmatrix} -1 & 4 \\ 0 & 5 \end{bmatrix}$ Then find the value of $x+y$

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**8.** If $A$ is $a3x3$ matrix, $|A| \neq 0$ and $|3A| = k|A|$ , then write the value of $k$ .

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**9.** If $A = \begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$ is a symmetric matrix, then $x = ?$

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**10.** Matrix $A = \begin{bmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & -1 \end{bmatrix}$ is given to be symmetric, find the values of $a$ and $b$

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**11.** For a invertible matrix $A$ if $A(adjA) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$ then $|A| =$

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**12.** Find X, if $A + X = I$, where

$A = \begin{bmatrix} 1 & 4 & -1 \\ 3 & 4 & 7 \\ 5 & 1 & 6 \end{bmatrix}$

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**13.** If $U = [2 \ \ -3 \ \ 4], V = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}, X = [0 \ \ 2 \ \ 3]$ and $Y = \begin{bmatrix} 2 \\ 2 \\ 4 \end{bmatrix}$, then find $UV + XY$

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**14.** If $\begin{bmatrix} 2 & -3 \\ 6 & 5 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} -4 & -9 \\ 16 & 15 \end{bmatrix}$

Write the equation after applying elementary column transformation $C_2 \to C_2 + 2C_1$

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**15.** If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$, then find the value of $A^3$.

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**16.** Find the value of $a_{23} + a_{32}$ in the matrix

$A = [a_{ij}]_{3\times 3}$ where $a_{ij} = \begin{cases} |2i - j| & \text{if } i > j \\ -i + 2j + 3 & \text{if } i < j \end{cases}$

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**17.** If $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix}$, then find $\left|A^2\right|$.

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**18.** For what value of x, is the matrix

$A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & x & -3 \\ 2 & 3 & 0 \end{bmatrix}$ a skew-symmetric matrix

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**19.** If $A = \begin{bmatrix} \sin 15^\circ \cos 15^\circ \\ -\sin 75^\circ \cos 75^\circ \end{bmatrix}$, then evaluate |A|.

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**20.** If A is a square matrix, expressed as $A = X + Y$ where X is symmetric and Y is skew-symmetric, then write the values of X and Y.

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**21.** Write a matrix of order $3 \times 3$ which is both symmetric and skew-symmetric matrix.

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**22.** What positive value of $x$ makes the following pair of determinants equal? $|2x35x|, \ |16352|$

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**23.** $\Delta = \begin{vmatrix} 5 & 3 & 8 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{vmatrix}$, find the value of $5a_{31} + 3a_{32} + 8a_{33}$.

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**24.** If $A = \begin{bmatrix} 2 & 1 \\ 7 & 5 \end{bmatrix}$, find $|A(adjA)|$

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**25.** The maximum value of $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1 & 1 & 1+\cos\theta \end{vmatrix}$ is $\frac{1}{2}$

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**26.** If $A$ and $B$ are matrices of order 3 and $|A| = 5, |B| = 3$, the $|3AB| = 27 \times 5 \times 3 = 405$

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**27.** Evaluate $\begin{vmatrix} 3+2i & -6i \\ 2i & 3-2i \end{vmatrix}, i = \sqrt{-1}$

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**28.** Without expanding, find the value of $\begin{vmatrix} \cos ec^2\theta & \cot^2\theta & 1 \\ \cot^2\theta & \cos ec^2\theta & -1 \\ 42 & 40 & 2 \end{vmatrix}$

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**29.** Using determinants, find the equation of line passing through (0, 3) and (1, 1).

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**30.** If A be any square matix of order $3 \times 3$ and $|A| = 5$, then find the value of $|adj(adjA)|$

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**31.** What is the number of all possible matrices of order $2 \times 3$ with each entry 0,1 or 2.

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**32.** Given a square matrix A of order $3 \times 3$ such that $|A| = 12$, find the value of $|\mathrm{A}\ \ \mathrm{adj}\ \ \mathrm{A}|$

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**33.** If $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$ find $\left|\left(A^{-1}\right)^{-1}\right|$

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**34.** If $A = [-1\ \ 2\ \ 3]$ and $B = \begin{bmatrix} 3 \\ -4 \\ 0 \end{bmatrix}$ find $|AB|$

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**35.** Find |A (adjoint A)| and |adjoint A|, if $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$

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## Two Mark Questions

**1.** Construct a matrix of order $2 \times 3$, whose elements are given by (a) $aij = \frac{(i-2j)^2}{2}$

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**2.** If $A(x_1, y_1), B(x_2, y_2)$ and $C(x_3, y_3)$ are vertices of on equilateral triangle with each side equal to a units, than prove that $\begin{vmatrix} x_1 & y_1 & 2 \\ x_2 & y_2 & 2 \\ x_3 & y_3 & 2 \end{vmatrix}^2 = 3a^4$

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**3.** Show that the elements on the main diagonal of a skew-symmetric matrix are all zero.

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**4.** Find the value of x and y, when

(i) $\begin{bmatrix} x+y \\ x-y \end{bmatrix} = \begin{bmatrix} 8 \\ 4 \end{bmatrix}$

(ii) $\begin{bmatrix} 2x+5 & 7 \\ 0 & 3y-7 \end{bmatrix} = \begin{bmatrix} x-3 & 7 \\ 0 & -5 \end{bmatrix}$

(iii) $2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$

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**5.** If A and B are symmetric matrices of the same order, show that AB+BA is symmetric.

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**6.** Show that $\begin{vmatrix} 0 & p-q & p-r \\ q-p & 0 & q-r \\ r-p & r-q & 0 \end{vmatrix} = 0$

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**7.** Let $A = \begin{bmatrix} 2 & 5 \\ 4 & 6 \end{bmatrix}$ Prove that $A + A^T$ is symmetric matrix

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**8.** If $A = \begin{bmatrix} 2 \\ 3 \\ 5 \end{bmatrix}$ and $B = [1\ 2\ 3]$, Verify $(AB)' = B'A'$

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**9.** If $A = \begin{bmatrix} 1 & 0 & -2 \\ 3 & -1 & 0 \\ -2 & 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 & 5 & -4 \\ -2 & 1 & 3 \\ -1 & 0 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 5 & 2 \\ -1 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix}$ verify that $A(B-C) = (AB-AC)$.

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**10.** If $A = [1321]$ , find the determinant of the matrix $A^2 - 2A$ .

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**11.** Without expanding evaluate the determinant $= |26524021924022519821919818 1|$ .

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**12.** If $D_1 = \begin{vmatrix} a & b & c \\ x & y & z \\ l & m & n \end{vmatrix}$ and $D_2 = \begin{vmatrix} m & -b & y \\ -l & a & -x \\ n & -c & z \end{vmatrix}$ evaluate $D_1 + D_2$.

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**13.** If A is a skew-symmetric matrix of odd order $n$, then $|A| = 0$

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**14.** Write the minors and co-factors of each elements of the first column of the matrix A $A = \begin{bmatrix} 1 & -3 & 2 \\ 4 & -1 & 2 \\ 3 & 5 & 2 \end{bmatrix}$

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**15.** For what values of x and y are the following matrices equal ?

$A = \begin{bmatrix} 2x+1 & 3y \\ 0 & y^2 - 5y \end{bmatrix}, B = \begin{bmatrix} x+3 & y^2+2 \\ 0 & -6 \end{bmatrix}$

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**16.** If $A = \begin{bmatrix} 2 & -2 \\ 4 & 2 \\ -5 & 1 \end{bmatrix}, B = \begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$, find matrix 'C', such that $2A + 3C = 5B$

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**17.** If $A = \begin{bmatrix} x & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$ find x such that $A^2 = B$.

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**18.** Construct a matrix of order $3 \times 2$, whose elements $a_{ij}$ given by

aij = $\begin{cases} 2i - 3j & i \geq j \\ 3i + j & i < j \end{cases}$

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## Four Mark Questions

**1.** If $\begin{vmatrix} a & y & z \\ x & b & z \\ x & y & c \end{vmatrix} = 0$, then prove that $\frac{a}{a-x} + \frac{b}{b-y} + \frac{c}{c-z} = 2$

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**2.** If $a \neq b \neq c$, are value of x which satisfies the equation

$$\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0 \text{ is given by}$$

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**3.** a a+b a+2b 10. Using properties of determinants, show that

$$\begin{vmatrix} a & a+b & a+2b \\ a+2b & a & a+b \\ a+b & a+2b & a \end{vmatrix} = 9b^2(a+b)$$

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**4.** The value of $\begin{vmatrix} \sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5 \end{vmatrix}$

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**5.** If $A = \begin{bmatrix} 5 & 3 \\ 12 & 7 \end{bmatrix}$, show that $A^2 - 12A - I = 0$. Hence find $A^{-1}$.

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**6.** Find the matrix X so that $X\begin{bmatrix}1 & 2\\ 5 & 3\end{bmatrix} = \begin{bmatrix}5 & 10\\ 2 & 0\end{bmatrix}$

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**7.** If $A = |122212221|$, verifty that $A^2 - 4A - 5I = 0$

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**8.** Using elementary transformations find the inverse of the matrix

$A = \begin{bmatrix}2 & 1\\ 4 & 7\end{bmatrix}$

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**9.** If $A = \begin{bmatrix}x & -2\\ 3 & 7\end{bmatrix}$ and $A^{-1} = \begin{bmatrix}\frac{7}{34} & \frac{1}{17}\\ \frac{-3}{34} & \frac{2}{17}\end{bmatrix}$,then the value of x is

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**10.** If $A = \begin{bmatrix} 2 & -3 \\ 0 & 1 \end{bmatrix}$, find B, such that $4A^{-1} + B = A^2$

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**11.** Let $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ and $10B = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$. If B is the inverse of A, then $\alpha$ is :

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**12.** Find $A^2 - 5A + 6I$, if $A = [2012131 - 10]$

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**13.** If $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & -1 & 4 \\ -2 & 2 & 1 \end{bmatrix}$, find $(A')^{-1}$

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**14.** The monthly incomes of Aryan and Babban are in the ratio 3 : 4 and their monthly expenditures are in the ratio 5 : 7. If each saves Rs. 15000 per month, find their monthly incomes using matrix method. This problem reflects which value?

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**15.** If $A = \begin{bmatrix} 0 & -1 & 2 \\ 4 & 3 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 0 \\ 1 & 3 \\ 2 & 6 \end{bmatrix}$ then verify that

(i) (A')'=A

(ii) (AB)'=B'A'

(iii) (KA)'=(KA)

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**16.** If $A = \begin{bmatrix} 0 & -x \\ x & 0 \end{bmatrix}. B \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $x^2 = -1$, then show that $(A+B)^2 = A^2 + B^2$.

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**17.** Prove that $aI + bA + cA^2 = A^3$, if $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ a & b & c \end{bmatrix}$

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**18.** If $A = \begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$, find $A^2$

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**19.** If $A = \begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix}, B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ and $(A+B)^2 = A^2 + B^2 + 2AB$, then

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**20.** If $A = \begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$, then find the value of a, b and c. Such that $A^T A = I$

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**21.** If $A = \begin{bmatrix} a & b \\ 0 & 1 \end{bmatrix}$ then prove that $A^n = \begin{bmatrix} a^n & \frac{b(a^n-1)}{a-1} \\ 0 & 1 \end{bmatrix}$

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**22.** Find the value of k, if: $\begin{vmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{vmatrix} = k \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

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**23.** If x,y and $z \in R$, and

$$\Delta = \begin{vmatrix} x & x+y & x+y+z \\ 2x & 5x+2y & 7x+5y+2z \\ 3x & 7x+3y & 9x+7y+3z \end{vmatrix} = -16,$$ then find value of x.

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**24.** If $\begin{vmatrix} 1 & a^2 & a^4 \\ 1 & b^2 & b^4 \\ 1 & c^2 & c^4 \end{vmatrix} = k \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$ then $k$ is

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**25.** Evaluate the following: $\begin{vmatrix} 1 & & a^2-bc \\ 1 & b & b^2-ac \\ 1 & c & c^2-ab \end{vmatrix}$

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**26.** $\begin{vmatrix} 1 & a^2+bc & a^3 \\ 1 & b^2+ac & b^3 \\ 1 & c^2+ab & c^3 \end{vmatrix} = -(a-b)(b-c)(c-a)\left(a^2+b^2+c^2\right)$

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**27.** Using properties of determinants, prove that following:

$$|a+b+2c\ a\ b\ b+c+2a\ b\ c\ c+a+2b| = 2(a+b+c)^3$$

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**28.** $$\begin{vmatrix} a & b & c \\ a-b & b-c & c-a \\ b+c & c+a & a+b \end{vmatrix} = a^3+b^3+c^3-3abc$$

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**29.** Prove that :

(i) $$\begin{vmatrix} a & c & a+c \\ a+b & b & a \\ b & b+c & c \end{vmatrix} = 2abc$$

(ii) Prove that : $$\begin{vmatrix} a^2 & bc & ac+c^2 \\ a^2+ab & b^2 & ac \\ ab & b^2+bc & c^2 \end{vmatrix} = 4a^2b^2c^2$$

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**30.** $\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 2\left(3abc - a^3 - b^3 - c^3\right)$

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**31.** Prove that $\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$

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**32.** Given $A = \begin{bmatrix} 0 & -1 & 2 \\ 2 & -2 & 0 \end{bmatrix}$ and $B - \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{bmatrix}$. Find the product AB and also find $(AB)^{-1}$

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**33.** Using properties of determinants, solve the following for x:

$|x - 22x - 33x - 4x - 42x - 93x - 16x - 82x - 273x - 64| = 0$

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**34.** FInd $x$ when $\begin{vmatrix} x+a & a^2 & a^3 \\ x+b & b^2 & b^3 \\ x+c & c^2 & c^3 \end{vmatrix} = 0$ where $a, b, c$ are distinct numbers and $a \neq b \neq c$

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**35.** Express the matrix $[3 - 2 - 43 - 2 - 5 - 112]$ as the sum of a symmetric and skew-symmetric matrix and verify your result.

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**36.** If $x = -4$ is a root of a $\Delta = \begin{vmatrix} x & 2 & 3 \\ 1 & x & 1 \\ 3 & 2 & x \end{vmatrix} = 0$, then find the other two roots.

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**37.** Using properties of determinants. Find the value of 'x'

$$\begin{vmatrix} 4-x & 4+x & 4+x \\ 4+x & 4-x & 4+x \\ 4-x & 4+x & 4+x \end{vmatrix} = 0$$

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**38.** prove that

$$\begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & x(x+1) \\ 3x(1-x) & x(x-1)(x-2) & x(x+1)(x-1) \end{vmatrix} = 6x^2(1-x^2)$$

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**39.** If $f(x) = |a - 10axa - 1ax^2axa|$ , using properties of determinants, find the value of $f(2x) - f(x)$ .

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**40.** If $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ show that $A^2 - 5A + 4I = 0$

Hence find $A^{-1}$

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**41.** It $A = \begin{bmatrix} -1 & 2 & 0 \\ -1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ show that $A^2 = A^{-1}$

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## Six Mark Questions

**1.** Prove that

$$\left|yz - x^2zx - y^2xy - z^2zx - y^2xy - z^2yz - x^2xy - z^2yz - x^2zx - y^2\right|$$

is divisible by $(x + y + z)$, and hence find the quotient.

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**2.** Using elementary tansformations, find the inverse of the matrix

$$A = \begin{bmatrix} 8 & 4 & 3 \\ 2 & 1 & 1 \\ 1 & 2 & 2 \end{bmatrix}$$

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**3.** Using matrix method, solve the system of linear equations

$x - 2y = 10, 2x - y - z = 8$ and $-2y + z = 7$

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**4.** Find $A^{-1}$ if $A = \begin{vmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix}$ and show that $A^{-1} = \frac{A^2 - 3I}{2}$

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**5.** Find the matrix $x$ for which $\begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix} x \begin{bmatrix} -1 & 1 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 0 & 4 \end{bmatrix}$

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**6.** Let $A = [23 \quad -12]$ and $f(x) = x^2 - 4x + 7$ . Show that $f(A) = O$ .

Use this result to find $A^5$ .

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**7.** If $a + b + c = 0$ and $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$, then show that either $x = 0$ or $x = \pm\sqrt{\frac{3}{2}(a^2 + b^2 + c^2)}$

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**8.** If $A + B + C = \pi$, then value of $\begin{vmatrix} \sin(A+B+C) & \sin B & \cos C \\ -\sin B & 0 & \tan A \\ \cos(A+B) & -\tan A & 0 \end{vmatrix}$

is

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9. $\begin{vmatrix} (x-2)^2 & (x-1)^2 & x^2 \\ (x-1)^2 & x^2 & (x+1)^2 \\ x^2 & (x+1)^2 & (x+2)^2 \end{vmatrix} = -8.$

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10. Prove $\begin{vmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ac & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{vmatrix} = (ab+bc+ca)^2$

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11. Prove that: $\begin{vmatrix} a & a+c & a-b \\ b-c & b & b+a \\ c+b & c-a & c \end{vmatrix} = (a+b+c)(a^2+b^2+c^2)$

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12. If a,b,c are positive and ar the $p^{th}$, $q^{th}$, $r^{th}$ terms respectively of a G.P show without expanding that, $\begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix} = 0$

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**13.** Prove that $(x-2)(x-1)$ is factor of $\begin{vmatrix} 1 & 1 & x \\ \beta+1 & \beta+1 & \beta+x \\ 3 & x+1 & x+2 \end{vmatrix}$ and hence find the quotient.

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**14.** Show that $\begin{vmatrix} -a(b^2+c^2-a^2) & 2b^3 & 2c^3 \\ 2a^3 & -b(c^2+a^2-b^2) & 2c^3 \\ 2a^3 & 2b^3 & -c(a^2+b^2-C^2) \end{vmatrix} = abc(a^2+b^2+c^2)^3$

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**15.** Determination the product $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}\begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & 2 \\ 2 & 1 & 3 \end{bmatrix}$ and use it to solve the system of equations

$x-y+z=4, x-2y-2z=9, 2x+y+3z=1$

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**16.** If $A = [1 - 1121 - 3111]$, find $A^{-1}$ and hence solve the system of linear equation. $x + 2y + z = 4, -x + y + z = 0, x - 3y + z = 2$

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**17.** Solve given system of equations by matrix method:

$$\frac{2}{a} + \frac{3}{b} + \frac{4}{c} = -3, \frac{5}{a} + \frac{4}{b} - \frac{6}{c} = 4, \frac{3}{a} - \frac{2}{b} - \frac{2}{c} = 6$$

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**18.** To raise money for an orphanage, students of three schools A, B and C organized an exhibition in their locality, where they sold paper bags, scrap books and pastel sheets made by them using recycled paper, at the rate of Rs. 20, Rs. 15 and Rs. 5 per unit respectively. School A sold 25 paper bags, 10 scrap books and 30 pastel sheets, School B sold 20 paper bag, 15 scrap book and 30 pastel-sheets While school C sold 25 paper bags, 18

scrap books and 35 pastel sheets. Using matrices, find the total amount raised by each school.

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**19.** Two cricket teams honored their players for three values, excellent batting, to the point bowling and unparalleled fielding by giving Rs x, Rs y and Rs z per player respectively. The first team paid respectively 2, 2 and 1 players for the above values with a total money of 11 lakhs, while the second team paid respectively 1,2 and 2 players for these values with a total prize money of Rs. 9 lakhs. If the total award money for one person each for these values amount to Rs.6 lakhs, then express the above situation as a matrix equation and find award money per person for each value.

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**20.** If $\begin{bmatrix} 1 & 2 & 0 \\ -2 & -1 & -2 \\ 0 & -1 & 1 \end{bmatrix}$, find $A^{-1}$. Using $A^{-1}$, solve the system of linear equations $x - 2y = 10, 2x - y - z = 8, -2y + z = 7$.

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