MATHS

NCERT - NCERT MATHEMATICS(ENGLISH)

DETERMINANTS

Exercise 4 3

1. Find values of k if area of triangle is 4 sq. units and vertices are

(i) $(k, 0), (4, 0), (0, 2)$

(ii) $(-2, 0), (0, 4), (0, k)$

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2. Find area of the triangle with vertices at the point given in each of the following :

(i) $(1, 0), (6, 0), (4, 3)$

(ii) $(2, 7), (1, 1), (10, 8)$

(iii) $(-2, -3), (3, 2), (-1, -8)$

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3. Show that points $A(a, b+c), B(b, c+a), C(c, a+b)$ are collinear.

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4. (i) Find equation of line joining (1,2) and (3,6) using determinants,

(ii) Find equation of line joining (3, 1) and (9,3) using determinants.

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5. If area of triangle is 35 sq units with vertices $(2, -6), (5, 4) and (k, 4)$. Then k is

(A) 12 (B) -2 (C) $12, 2$ (D) $12, 2$

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Exercise 4 5

1. For the matrix $A = [11112 - 32 - 13]$. Show that $A^3 - 6A^2 + 5A + 11\, I_3 = O$. Hence, find A^{-1} .

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2. For the matrix A= $\begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$, find the numbers a and b such that $A^2 + aA + bI = O.$

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3. If A is an invertible matrix of order 2, then det $\left(A^{-1}\right)$ is equal to

(A) det (A) (B) $\dfrac{1}{\det(A)}$ (C) 1 (D) 0

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4. Find the inverse the matrix (if it exists)given in $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\alpha & \sin\alpha \\ 0 & \sin\alpha & -\cos\alpha \end{bmatrix}$

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5. If $A = \begin{vmatrix} 3 & 2 \\ 7 & 5 \end{vmatrix}$ and $B = \begin{vmatrix} 6 & 7 \\ 8 & 9 \end{vmatrix}$, verify that $(AB)^{-1} = B^{-1}A^{-1}$.

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6. Let A be a non-singular square matrix of order 3 $\times$ 3. Then |adj A| is equal to

(A) $|A|$ (B) $|A|^2$(C) $|A|^3$ (D) $3|A|$

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7. If $A = [2 - 11 - 12 - 11 - 12]$. Verify that $A^3 - 6A^2 + 9A - 4I = O$ and hence find A^{-1}.

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8. Find the inverse the matrix (if it exists)given in $\begin{bmatrix} 1 & 0 & 0 \\ 3 & 3 & 0 \\ 5 & 2 & -1 \end{bmatrix}$

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9. Find the inverse the matrix (if it exists) given in $\begin{bmatrix} 2 & 1 & 3 \\ 4 & -1 & 0 \\ -7 & 2 & 1 \end{bmatrix}$

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10. Find adjoint of the matrice in $\begin{bmatrix} 1 & -1 & 2 \\ 2 & 3 & 5 \\ -2 & 0 & 1 \end{bmatrix}$

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11. Verify $A(adjA) = (adjA)A = |A|If \text{ or } \begin{bmatrix} 2 & 3 \\ -4 & -6 \end{bmatrix}$

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12. Find adjoint of the matrice in $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

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13. Find the inverse the matrix (if it exists)given in $\begin{bmatrix} -1 & 5 \\ -3 & 2 \end{bmatrix}$

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14. Find the inverse the matrix (if it exists)given in $\begin{bmatrix}1 & 2 & 3\\0 & 2 & 4\\0 & 0 & 5\end{bmatrix}$

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15. Verify $A(adjA) = (adjA)A = |A|I$

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

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16. Find the inverse the matrix (if it exists)given in $\begin{bmatrix}2 & -2\\4 & 3\end{bmatrix}$

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17. Find the inverse the matrix (if it exists)given in $\begin{bmatrix}1 & -1 & 2\\0 & 2 & -3\\3 & -2 & 4\end{bmatrix}$

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

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Exercise 4 1

1. If $A = \begin{bmatrix} 1 & 1 & -2 \\ 2 & 1 & -3 \\ 5 & 4 & -9 \end{bmatrix}$. Find $|A|$.

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2. Find values of x, if(i) $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} - \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$ (ii) $\begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix} - \begin{vmatrix} x & 3 \\ 2x & 5 \end{vmatrix}$

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3. If $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$, then show that $|3A| = 27|A|$

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4. Evaluate the determinants

(i) $\begin{vmatrix} 3 & -1 & -2 \\ 0 & 0 & -1 \\ 3 & -5 & 0 \end{vmatrix}$ (ii) $\begin{vmatrix} 3 & -4 & 5 \\ 1 & 1 & -2 \\ 2 & 3 & 1 \end{vmatrix}$ (iii) $\begin{vmatrix} 0 & 1 & 2 \\ -1 & 0 & -3 \\ -2 & 3 & 0 \end{vmatrix}$ (iv) $\begin{vmatrix} 2 & -1 & -2 \\ 0 & 2 & -1 \\ 3 & -5 & 0 \end{vmatrix}$

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5. Evaluate the determinants in(i) $\begin{vmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{vmatrix}$ (ii) $\begin{vmatrix} x^2 - x + 1 & x - 1 \\ x + 1 & x + 1 \end{vmatrix}$

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6. If $A = \begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$, then show that $|2A| = 4|A|$

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7. Evaluate the determinants $\begin{vmatrix} 2 & 4 \\ -5 & -1 \end{vmatrix}$

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8. If $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix}$=$\begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$, then x is equal to (A) 6 (B) ± 6 (C) -6 (D) 0

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Exercise 4 6

1. Solve system of linear equations, using matrix method,

$2x + 3y + 3z = 5 \quad x - 2y + z = -4 \quad 3x - y - 2z = 3$

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2. Examine the consistency of the system of equations

$x + 2y = 2 \quad 2x + 3y = 3$

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3. Solve system of linear equations, using matrix method,

$5x + 2y = 4, \quad 7x + 3y = 5$

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4. Examine the consistency of the system of equations

$5x - y + 4z = 5, \quad 2x + 3y + 5z = 2, \quad 5x - 2y + 6z = 1$

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5. Examine the consistency of the system of equations

$3x - y - 2z = 2 \quad 2y - z = 1 \quad 3x - 5y = 3$

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6. Examine the consistency of the system of equations

$x + y + z = 1$

$2x + 3y + 2z = 2$

$ax + ay + 2az = 4$

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7. If $A = \begin{pmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{pmatrix}$ find A^{-1}. Use it to solve the system of equations $2x - 3y + 5z = 11$, $3x + 2y - 4z = -5$ and $x + y - 2z = -3$

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8. Solve system of linear equations, using matrix method,

$5x + 2y = 3 \quad 3x + 2y = 5$

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9. Solve system of linear equations, using matrix method,

$2x + y + z = 1 \quad x - 2y - z = \frac{3}{2} \quad 3y - 5z = 9$

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10. Solve system of linear equations, using matrix method,

$x - y + z = 4 \quad 2x + y - 3z = 0 \quad x + y + z = 2$

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11. Solve system of linear equations, using matrix method,

$4x - 3y = 3 \quad 3x - 5y = 7$

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12. Solve system of linear equations, using matrix method,

$2x - y = -2 \quad 3x + 4y = 3$

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13. Examine the consistency of the system of equations

$x + 3y = 5 \quad 2x + 6y = 8$

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14. Examine the consistency of the system of equations

$2x - y = 5 \quad x + y = 4$

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15. The cost of 4 kg onion, 3 kg wheat and 2 kg rice is Rs 60. The cost of 2 kg onion, 4 kg wheat and 6 kg rice is Rs 90. The cost of 6 kg onion 2 kg wheat and 3 kg rice is Rs 70. Find cost of each item per kg by matrix method.

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Solved Examples

1. Evaluate $\begin{vmatrix} 2 & 4 \\ -1 & 2 \end{vmatrix}$

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2. Evaluate the determinant$\Delta =$ |(1,2,4),(-1,3,0),(4,1,0)|`

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3. Evaluate $\begin{vmatrix} x & x+1 \\ x-1 & x \end{vmatrix}$

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

A. $x = \pm 2\sqrt{2}$

B. $x = \pm 2\sqrt{3}$

C. $x = \pm 5\sqrt{2}$

D. $x = \pm 2\sqrt{7}$

Answer: A

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5. Evaluate $\Delta = |0 \sin\alpha - \cos\alpha - \sin\alpha 0 \sin\beta \cos\alpha - \sin\beta 0|$

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6. Find minors and cofactors of the elements of the determinant $|2 - 3560415 - 7|$and verify that $a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33} = 0$

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7. Verify Property 1 for $\Delta = \begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$

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8. Write the value of the following determinant: $\begin{vmatrix} 102 & 18 & 36 \\ 1 & 3 & 4 \\ 17 & 3 & 6 \end{vmatrix}$

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9. Evaluate $\Delta = |323223323|$

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10. Without expanding, prove that $\Delta = \begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix} = 0$

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11. Evaluate$\Delta = |1abc1bca1cab|$

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12. Show that $|abca + 2xb + 2yc + 2zxyz| = 0$

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13. Prove that

$|aa+ba+b+c2a3a+2B4a+3b+2c3a6a+3b10a+6b+3c| = a^3$

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14. Show that

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right) = abc+bc+ca+ab$$

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15. Find the area of the triangle whose vertices are $(3, 8)$,$(-4, 2)$and $(5, 1)$.

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16. Prove: $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$

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17. If x, y, z are different and $\Delta = \left| \times^2\ 1 + x^3 yy^2 1 + y^3 zz^2 1 + z^3 \right| = 0$

, then

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18. Find the equation of the line joining A(1,3) and B (0,0) using determinants and find k if D(k, 0) is a point such that area of triangle ABD is 3sq units.

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19. Find the minor of element 6 in the determinant $\Delta = |123456789|$

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20. The sum of three numbers is 6. If multiply theird number by 3 and add second number to it, we get 11. By adding first and third numbers, we get double of the second number . Find the numbers using matrix method.

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21. Solve the following system of equations by matrix method.

$3x - 2y + 3z = 8$

$2x + y - z = 1$

$4x - 3y + 2z = 4$

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22. Solve the system of equations $2x + 5y = 1$ and $3x + 2y = 7$

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23. Show that the matrix $A = [2312]$satisfies the equation $A^2 - 4A + I = 0$

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24. If $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$and $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$, then verify that $(AB)^{-1} = B^{-1}A^{-1}$

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25. If $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$,then verify that $A adj A = |A|I$. Also find A^{-1}.

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26. Find adj for $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$

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27. Find minors and cofactors of the elements of the determinant $|2 - 3560415 - 7|$and verify that $a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33} = 0$

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28. Find minors and cofactors of the elements a_{11}, a_{21}in the determinant $\Delta = |a_{11}a_{12}a_{13}a_{21}a_{22}a_{23}a_{31}a_{32}a_{23}|$

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29. Find minors and cofactors of all the elements of the determinant $\begin{vmatrix} 1 & -2 \\ 4 & 3 \end{vmatrix}$

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30. If a, b, c are positive and unequal, show that value of the determinant $\Delta = \left|abcbcacab\right|$ is negative.

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31. If a, b, c are in A.P, find value of $\begin{vmatrix} 2y+4 & 5y+7 & 8y+a \\ 3y+5 & 6y+8 & 9y+b \\ 4y+6 & 7y+9 & 10y+c \end{vmatrix}$

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32. Show that

$$\Delta = \begin{vmatrix} (y+z)^2 & xy & zx \\ xy & (x+z)^2 & yz \\ xz & yz & (x+y)^2 \end{vmatrix} = 2xyz(x+y+z)^3.$$

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33. Use product $[1 - 1202 - 33 - 24]\ [-20192 - 361 - 2]$ to solve the system of equation: $x - y + 2z = 1 \quad 2y - 3z = 1$ $3x - 2y + 4z = 2$

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34. Without expanding, prove that
$$\begin{vmatrix} a+bx & c+dx & p+qx \\ ax+b & cx+d & px+q \\ u & v & w \end{vmatrix} = \left(1-x^2\right)\begin{vmatrix} a & c & p \\ b & d & q \\ u & v & w \end{vmatrix}.$$

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Miscellaneous Exercise

1. 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

(A) $Det(A) = 0$

(B) $Det(A) \in (2, \infty)$

(C) $Det(A) \in (2, 4)$

(D) $Det(A) \in [2, 4]$

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2. If x, y, z are non-zero real numbers, then the inverse of matrix $A = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$ is

(A) $\begin{bmatrix} x^{-1} & 0 & 0 \\ 0 & y^{-1} & 0 \\ 0 & 0 & z^{-1} \end{bmatrix}$

(B) $xyz \begin{bmatrix} x^{-1} & 0 & 0 \\ 0 & y^{-1} & 0 \\ 0 & 0 & z^{-1} \end{bmatrix}$

(C) $\frac{1}{xyz} \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$

(D) $\frac{1}{xyz} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

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3. If a, b, c, are in A.P, then the determinant $\begin{vmatrix} x+2 & x+3 & x+2a \\ x+3 & x+4 & x+2b \\ x+4 & x+5 & x+2c \end{vmatrix}$ is

(A) 0 (B) 1 (C) x (D) $2x$

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4. Solve the system of equations $\frac{2}{x}+\frac{3}{y}+\frac{10}{z}=4, \frac{4}{x}-\frac{6}{y}+\frac{5}{z}=1,$ $\frac{6}{x}+\frac{9}{y}-\frac{20}{z}=2$

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5. Using properties of determinants. Prove that

$$\begin{vmatrix} \sin\alpha & \cos\alpha & \cos(\alpha+\delta) \\ \sin\beta & \cos\beta & \cos(\beta+\delta) \\ \sin\gamma & \cos\gamma & \cos(\gamma+\delta) \end{vmatrix}=0$$

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6. Using properties of determinants. Prove that

$$\begin{vmatrix} 1 & 1+p & 1+p+q \\ 2 & 3+2p & 4+3p+2q \\ 3 & 6+3p & 10+6p+3q \end{vmatrix} = 1$$

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7. Using properties of determinants. Prove that

$$\begin{vmatrix} 3a & -a+b & -a+c \\ -b+a & 3b & -b+c \\ -c+a & -c+b & 3c \end{vmatrix} = 3(a+b+c)(ab+bc+ca)$$

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8. Using properties of determinants, prove the following:

$$\left| \times^2\ 1+px^3yy^21+py^3zz^21+pz^3 \right| = (1+pxyz)(x-y)(y-z)(z-x)$$

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9. Using properties of determinants. Prove that $\begin{vmatrix}\alpha & \alpha^2 & \beta+\gamma\\ \beta & \beta^2 & \gamma+\alpha\\ \gamma & \gamma^2 & \alpha+\beta\end{vmatrix} = (\beta-\gamma)(\gamma-\alpha)(\alpha-\beta)(\alpha+\beta+\gamma)$

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10. Evaluate $\begin{vmatrix}1 & x & y\\ 1 & x+y & y\\ 1 & x & x+y\end{vmatrix}$

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11. Let $A = \begin{bmatrix}1 & -2 & 1\\ -2 & 3 & 1\\ 1 & 1 & 5\end{bmatrix}$. Verify that ltbtgt (i) $[adjA]^{-1} = adj\left(A^{-1}\right)$

(ii) $\left(A^{-1} \hat{} (-1)\right) = A$

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12. Evaluate $\begin{vmatrix} x & y & x+y \\ y & x+y & x \\ x+y & x & y \end{vmatrix}$.

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13. Without expanding the determinant, prove that

$$\begin{vmatrix} a & a^2 & bc \\ b & b^2 & ca \\ c & c^2 & ab \end{vmatrix} = \begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix}$$

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14. Evaluate $\begin{vmatrix} \cos\alpha\cos\beta & \cos\alpha\sin\beta & -\sin\alpha \\ -\sin\beta & \cos\beta & 0 \\ \sin\alpha\cos\beta & \sin\alpha\sin\beta & \cos\alpha \end{vmatrix}$

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15. If a, b and c are real numbers, and

$\Delta = |b + \ + aa + bc + aa + \ + ca + \ + \ + a| = 0$ .Show that either

$a + b + c = 0$ or $a = b = c$.

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16. Solve the equation $\begin{vmatrix} x+a & x & x \\ x & x+a & x \\ x & x & x+a \end{vmatrix} = 0, a \neq 0$

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17. Prove: $\left|a^2bcac + c^2a^2 + a\ \hat{}\ 2aca\ \hat{}\ 2 + b\ \hat{}\ 2\right| = 4a^2b^2c^2$

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18. Prove that the determinant $\begin{bmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{bmatrix}$ is independent of θ.

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19. If $A^{-1} = [3 - 11 - 156 - 55 - 22]$ and $B = [12 - 2 - 1300 - 21]$, find $(AB)^{-1}$.

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Exercise 4 4

1. Write Minors and Cofactors of the elements of following determinants:

(i) $\begin{vmatrix} 2 & -4 \\ 0 & 3 \end{vmatrix}$ (ii) $\begin{vmatrix} a & c \\ b & d \end{vmatrix}$

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2. Using Cofactors of elements of second row, evaluate $\Delta = \begin{vmatrix} 5 & 3 & 8 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{vmatrix}$

A. 7

B. 8

C. 9

D. 10

Answer: A

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3. Write Minors and Cofactors of the elements of following determinants:

(i) $\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$ (ii) $\begin{vmatrix} 1 & 0 & 4 \\ 3 & 5 & -1 \\ 0 & 1 & 2 \end{vmatrix}$

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4. If $\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$ and A_{ij} is cofactors of a_{ij}, then value of Δ is given by

A. $a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33}$

B. $a_{11}A_{11} + a_{12}A_{21} + a_{13}A_{31}$

C. $a_{21}A_{11} + a_{22}A_{12} + a_{23}A_{13}$

D. $a_{11}A_{11} + a_{21}A_{21} + a_{31}A_{31}$

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5. Using Cofactors of elements of third column, evaluate

$$\Delta = \begin{vmatrix} 1 & x & yz \\ 1 & y & zx \\ 1 & z & xy \end{vmatrix}$$

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Exercise 4 2

1. Using the property of determinants and without expanding, prove that:

$$\begin{vmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ca & cb & -c^2 \end{vmatrix} = 4a^2b^2c^2$$

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2. Using the property of determinants and without expanding, prove that: $\begin{vmatrix} 0 & a & -b \\ -a & 0 & -c \\ b & c & 0 \end{vmatrix} = 0$

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3. Using the property of determinants and without expanding, prove that: $\begin{vmatrix} b+c & q+r & y+z \\ c+a & r+p & z+x \\ a+b & p+q & x+y \end{vmatrix} = 2\begin{vmatrix} a & p & x \\ b & q & y \\ c & r & z \end{vmatrix}$

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4. Using the property of determinants and without expanding, prove that: $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} = 0$

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5. Using the property of determinants and without expanding, prove that: $\begin{vmatrix} 2 & 7 & 65 \\ 3 & 8 & 75 \\ 4 & 9 & 86 \end{vmatrix} = 0$

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6. Using the property of determinants and without expanding, prove that: $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix} = 0$

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7. Using the property of determinants and without expanding, prove that: $\begin{vmatrix} x & a & x+a \\ y & b & y+b \\ z & c & z+c \end{vmatrix} = 0$

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8. By using properties of determinants. Show that:

$$\begin{vmatrix} x & x^2 & yz \\ y & y^2 & zx \\ z & z^2 & xy \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$$

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9. By using properties of determinants. Show that:

(i) $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

(ii) $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$

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10. By using properties of determinants. Show that:

(i) $\begin{vmatrix} x+4 & 2x & 2x \\ 2x & x+4 & 2x \\ 2x & 2x & x+4 \end{vmatrix} = (5x-4)(4-x)^2$

(ii) $\begin{vmatrix} y+k & y & y \\ y & y+k & y \\ y & y & y+k \end{vmatrix} = k^2(3y+k)$

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11. By using properties of determinants. Show that:

(i) $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$

(ii) $\begin{vmatrix} x+y+2z & x & y \\ z & y+z+2x & y \\ z & x & z+x+2y \end{vmatrix} = 2(x+y+z)^3$

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12. By using properties of determinants. Show that: $\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = \left(1-x^3\right)^2$

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13. By using properties of determinants. Show that:

$$\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = \left(1+a^2+b^2\right)^3$$

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14. By using properties of determinants. Show that:

$$\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix} = \left(1+a^2+b^2+c^2\right)$$

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15. Let A be a square matrix of order 3×3, then $|kA|$is equal to

(A) $k|A|$ (B) $k^2|A|$ (C) $K^3|A|$ (D) $3k|A|$

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16. Which of the following is correct

(A) Determinant is a square matrix.

(B) Determinant is a number associated to a matrix.

(C) Determinant is a number associated to a square matrix.

(D) None of these

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