MATHS

BOOKS - ARIHANT MATHS (HINGLISH)

DETERMINANTS

Examples

1. If A and B are square matrices of the same order 3, such that $|A| = 2$ and $AB = 2I$, write the value of $|B|$.

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2. Evaluate $\begin{vmatrix} \cos 15^\circ, \sin 15^\circ \\ \sin 75^\circ, \cos 75^\circ \end{vmatrix}$

A. 0

B. 1

C. 2

D. 4

Answer: A

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3. If $\begin{vmatrix} 3x & 7 \\ -2 & 4 \end{vmatrix} = \begin{vmatrix} 8 & 7 \\ 6 & 4 \end{vmatrix}$, find the value of x.

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4. Expand $\begin{vmatrix} 3 & -5 & 4 \\ 7 & 6 & 1 \\ 1 & 2 & 3 \end{vmatrix}$

A. 180

B. 190

C. 18

D. 80

Answer: A

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5. Evaluate :

$$\Delta = \begin{vmatrix} 0 & \sin\alpha & -\cos\alpha \\ -\sin\alpha & 0 & \sin\beta \\ \cos\alpha & -\sin\beta & 0 \end{vmatrix}.$$

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6. Find the product of the determinants :

$$\begin{vmatrix} 1 & 2 & 1 \\ -1 & 0 & 0 \\ 1 & 0 & 1 \end{vmatrix} \times \begin{vmatrix} 1 & -1 & 0 \\ 0 & 1 & 2 \\ 2 & -1 & 1 \end{vmatrix}$$

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7. If $\alpha, \beta \text{and} \gamma$ are real number without expanding at any stage prove that

$$\begin{vmatrix} 1 & \cos(\beta-\alpha) & \cos(\gamma-\alpha) \\ \cos(\alpha-\beta) & 1 & \cos(\gamma-\beta) \\ \cos(\alpha-\gamma) & \cos(\beta-\gamma) & 1 \end{vmatrix}=0.$$

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8. Find the area of the triangle with vertices :

$(3, 8), (-4, 2), (5, 1)$.

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9. By using determinants , find the value of 'y' for which the points $(1, 3), (2, 5)$ and $(3, y)$ are collinear.

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10. A traingle has its three sides equal to a,b and c . If the co-ordinates of its vertices are $A(x_1, y_1), B(x_2, y_2)$ and $C(x_3, y_3)$, show that :

$$\begin{vmatrix} x_1 & y_1 & 2 \\ x_2 & y_2 & 2 \\ x_3 & y_3 & 2 \end{vmatrix}^2 = (a+b+c)(b+c-a)(c+a-b)(a+b-c).$$

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11. If $\Delta = \begin{vmatrix} 5 & 3 & 8 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{vmatrix}$, write :

(i) the minor of the element a_{23}

(ii) the co-factor of the element a_{32}.

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12. Find minors and cofactors of all the elements of the determinant

$|1 - 243|$

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13. If $A = [a_{ij}]$ is a matrix of order 2×2, such that $|A| = -15$ and c_{ij} represents co-factor of a_{ij}, then find $a_{21}c_{21} + a_{22}c_{22}$.

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14. If A_{ij} is the cofactor of the element a_{ij} of the determinant $[2 - 3 - 7604157]$, then write the value of $a_{32} \cdot A_{32}$.

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15. Find the mirrors and cofactors of the elements of the determinant

$$\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$$

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16. For what values of k, does the system of linear equations $x + y + z = 2, 2x + y - z = 3, 3x + 2y + kz = 4$ have a unique solution ?

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17. Using Cramer's Rule , solve the following system of equations :

$3x-2y=5, x-3y=-3$

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18. Examine the consistency of the system of equations$3xy2z=22yz=1$

$3x5y=3$

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19. Solve

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

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20. Using Cramer's Rule , solve the following system of equations :

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

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21. Solve :

$$2x - y + z = 4, x + 3y + 2z = 12, 3x + 2y + 3z = 16$$

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22. Solve following system of homogeneous linear equations:

$$x + y - 2z = 0, \; 2x + y - 3z = 0, \; 5x + 4y - 9z = 0$$

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Frequently Asked Questions

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

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2. Using properties of determinants prove that ((1,1, 1+3x),(1+3y,1,1),(1, 1+3z,1))=9(3xyz+xy+yz+zx)

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3. If $\Delta = \begin{vmatrix} 1 & a & a^2 \\ a & a^2 & 1 \\ a^2 & 1 & a \end{vmatrix} = -4$, then find the value of :
$\begin{vmatrix} a^3-1 & 0 & a-a^4 \\ 0 & a-a^4 & a^3-1 \\ a-a^4 & a^3-1 & 0 \end{vmatrix}$

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4. Prove that :

$$\begin{vmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{vmatrix} = 2\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}.$$

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5. $$\begin{vmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{vmatrix} = 0$$

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6. Without expanding, prove that the following determinants vanish :

$$\begin{vmatrix} a & b & a+b \\ b & c & b+c \\ c & a & c+a \end{vmatrix}$$

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7. If $f(x)\left|a - 10axa - 1ax^2axa\right|$, using properties of determinants, find the value of $f(2x) - f(x)\cdot$

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8. Using properties of determinants , find the value of k if

$$\begin{vmatrix} x & y & x+y \\ y & x+y & x \\ x+y & x & y \end{vmatrix} = k\left(x^3 + y^3\right).$$

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9. Prove that :

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

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10. If x, y, z are different and $\Delta = \begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$, show that :

$(i) 1 + xyz = 0$

$(ii) xyz = -1$

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11. Prove that :

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

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12. Show that $\begin{vmatrix} 1 & 1 & 1 \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} = (b-c)(c-a)(a-b)(bc+ca+ab)$

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13. Prove that

$$\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & bc & c^2+1 \end{vmatrix} = 1 + a^2 + b^2 + c^2.$$

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14. Prove that

$$|yz - x^2zx - y^2xy - z^2zx - y^2xy - z^2yz - x^2xy - z^2yz - x^2zx - y^2|$$

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

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15. 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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16. $\begin{vmatrix} x+2 & x+6 & x-1 \\ x+6 & x-1 & x+2 \\ x-1 & x+2 & x+6 \end{vmatrix} =$

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17. Using properties of determinants, prove that :

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

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Examples Frequency Asked Questions

1. If A is square matrix of order 3 , with $|A| = 9$, then write the value of $|2adj.\ A|$

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2. For what value of x, the matrix $[5 - \times + 124]$ is singular?

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3. If A and B are invertible matrices of order 3, $|A| = 2$ and $\left|(AB)^{-1}\right| = -\frac{1}{6}$, find $|B|$

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4. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{bmatrix}$, find $adj.\ A$

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5. Given $A = \begin{pmatrix} 2 & -3 \\ -4 & 7 \end{pmatrix}$ compute A^{-1} and show that $2A^{-1} = 9I - A$

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6. 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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7. Find the inverse of the matrix :

$$A = \begin{bmatrix} 0 & 1 & 2 \\ 0 & 1 & 1 \\ 1 & 0 & 2 \end{bmatrix}$$

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

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9. If $A = [231 - 4]$and $B = [1 - 2 - 13]$, then verify that $(AB)^{-1} = B^{-1}A^{-1}$

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10. If $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$, verify $A.\ (adj.\ A) = |A|I$ and find A^{-1}.

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11. Find the inverse of each of the matrices given below :

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$$(AB)^{-1} when A = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \text{ and } B^{-1} = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 3 & -1 \\ 1 & 0 & 2 \end{bmatrix}.$$

Find $A^{-1}. Then,$ (AB)^(-1)=B^(-1)A^(-1)`.

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

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13. x+2y=9

2x+4y=7

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14. Solve the following system of equations by matrix method :

$3x - 4y = 5$ and $4x + 2y = 3$

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15. Using matrices, solve the following system of equations: $4x + 3y + 3z = 60, \ x + 2y + 3z = 45$ and $6x + 2y + 3z = 70$

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16. Solve the following system of equations by matrix method : $x + y - 2 = 3 \quad 2x + 3y + z = 10 \quad 3x - y - 7z = 1 \quad x + y + z = 3$

$2x - y + z = -1 \quad 2x + y - 3z = -9 \quad 6x - 12y + 25z = 4$

$4x + 15y - 20z = 3 \quad 2x + 18y + 15z = 10 \quad 3x + 4y + 7z = 14$

$2x - y + 3z = 4 \quad x + 2y - 3z = 0 \quad \frac{2}{x} - \frac{3}{y} + \frac{3}{z} = 10$

$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 10 \quad \frac{3}{x} - \frac{1}{y} + \frac{2}{z} = 13 \quad 5x + 3y + z = 16$

$2x + y + 3z = 19 \quad x + 2y + 4z = 25 \quad 3x + 4y + 2z = 8 \quad 2y - 3z = 3$

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

$2x + 6y = 2 \quad 3x - z = -8 \quad 2x - y + z = -3 \quad 2y - z = 1$

$x - y + z = 2 \quad 2x - y = 0 \quad 8x + 4y + 3z = 18 \quad 2x + y + z = 5$

$x + 2y + z = 5 \quad x + y + z = 6 \quad x + 2z = 7 \quad 3x + y + z = 12$

$\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4, \quad \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1 \quad \frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2; x, y, z \neq 0$

$x - y + 2z = 7 \; 3x + 4y - 5z = -5 \; 2x - y + 3z = 12$

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17. Using elementary transformations, find the inverse of the matrix $A = (843211122)$ and use it to solve the following system of linear equations : $8x + 4y + 3z = 19 \; 2x + y + z = 5 \; x + 2y + 2z = 7$

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18. If $A = \begin{bmatrix} 2 & 3 & 4 \\ 1 & -1 & 0 \\ 0 & 1 & 2 \end{bmatrix}$, find A^{-1}. Hence, solve the system of equations

x-y=3,

2x+3y+4z=17,

y+2z=7

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19. If $A = \begin{bmatrix} 2 & 3 & 10 \\ 4 & -6 & 5 \\ 6 & 9 & -20 \end{bmatrix}$, find A^{-1}. Using A^{-1}, solve the system of equations : $\begin{matrix} \frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 2 \\ \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 5 \\ \frac{6}{x} + \frac{9}{y} - \frac{20}{z} = -4 \end{matrix}$

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20. Use product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}\begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the equations :

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

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21. Solve, using matrices :

$2x - y + 3z = 5, 3x + 2y - z = 7$ and $4x + 5y - 5z = 9$

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22. Solve the following systems of linear homogenous equations :

$2x + y - 3z = 0, x + 3y + z = 0$ and $3x - 2y + z = 0$

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23. Solve the following systems of linear homogenous equations :

$3x + 2y + 7z = 0, 4x - 3y - 2z = 0$ and $5x + 9y + 23z = 0$

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24. The sum of three numbers is -1. If we multiply second number by 2, third number by 3 and add them, we get 5. If we subtract the third number from the sum of first and second numbers, we get -1. Represent it by a system of equation. Find the numbers, using inverse of a matrix.

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25. 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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26. A typing changes rs 145 for typing 10 English and 1 Hindi page for typing 3 English and is Hindi pages are Rs 180. Using matrices, find the changes of typing 1 English and 1 Hindi pages separately. However, typing charged only Rs 2 per page from a poor students Shyam for 5 Hindi pages. How much less was charged from this poor boy? Which value are reflected in the problem ?

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27. Two schools A and B decided to award prizes to their students for three values honesty (x), puntuality (y) and obedience (z). School A decided to award a total of ₹11000 for the three values to $5, 4$ and 3 students respectively while school B decided to award ₹10700 for the three values to $4, 3$ and 5 students respectively. If all the three prizes together amount to ₹2700, then :

(i) Represent the above situation by a matrix equation and form linear equations, using matrix multiplication.

(ii) Is it possible to solve the system of equations so obtained, using matrix multiplication?

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28. The management committee of a residential colony decided to award some of its members (say x) for honesty, (say y) for helping others and some others (say z) for supervising the workers to keep the colony neat and clean. The sum of all the awardees is 12. Three times the sum of the awardees for cooperation and supervision added to two times the number of awardees for honesty is 33. If the sum of the number of awardees for honesty and supervision is twice the number of awardees for helping others. Using matrix method, find the number of awardees of each category.

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Examples Questions From Ncert Examplar

1. If $\Delta = \begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix}, \Delta_1 = \begin{vmatrix} 1 & 1 & 1 \\ yz & zx & xy \\ x & y & z \end{vmatrix}$, then prove that $\Delta + \Delta_1 = 0$

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2. 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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3. If A,B and C are the angles of a triangle and

$\begin{vmatrix} 1 & 1 & 1 \\ 1+\sin A & 1+\sin B & 1+\sin C \\ \sin A+\sin^2 A & \sin B+\sin^2 B & \sin C \sin^2 C \end{vmatrix}$ =0

then prove that Δ ABC must be isoceles.

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4. Show that if the determinant :

$\Delta = \begin{vmatrix} 3 & -2 & \sin 3\theta \\ -7 & 8 & \cos 2\theta \\ -11 & 14 & 2 \end{vmatrix} = \theta$, then $\sin\theta = 0$ or $\frac{1}{2}$.

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Exercise 4 A Short Answer Type Questions

1. Evalute the determinants in queations 1 and 2 :

Find the 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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2. Evalute the determinants in queations 1 and 2 :

Find the 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. Solve the equation: $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$

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4. Find the value of 'x' if :

$$\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 5 & 2 \\ 4 & -1 \end{vmatrix}$$

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5. Find the value of 'x' if :

$$\begin{vmatrix} 2x & 3 \\ 5 & 2 \end{vmatrix} = \begin{vmatrix} 16 & 3 \\ 5 & 2 \end{vmatrix}, x > 0$$

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6. if $\begin{vmatrix} x+1 & x-1 \\ x-3 & x+2 \end{vmatrix}$ = $\begin{vmatrix} 4 & -1 \\ 1 & 3 \end{vmatrix}$. find the value of x.

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7. Find the value of 'x' if :

$$\begin{vmatrix} -1 & 2 \\ 4 & 8 \end{vmatrix} = \begin{vmatrix} 2 & x \\ x & -4 \end{vmatrix}$$

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8. If $\left| \times 1x \right| = \left| 3412 \right|,$ write the positive value of $x\cdot$

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9. If $A = \begin{bmatrix} 1 & 3 \\ 4 & 1 \end{bmatrix}$, then find $|3A'|$.

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10. $\begin{vmatrix} 3 & -1 & -2 \\ 0 & 0 & -1 \\ 3 & -5 & 0 \end{vmatrix}$

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11. Write the minor and cofactor of each element of second column in the following determinants and evaluate them: $\begin{vmatrix} 4 & 9 & 7 \\ 3 & 5 & 7 \\ 5 & 4 & 5 \end{vmatrix}$

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12. Evalute 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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13. Evalute 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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14. Evaluate the following determinants :

$$\begin{vmatrix} 3 & -4 & 5 \\ 1 & 1 & -2 \\ 2 & 3 & 1 \end{vmatrix}$$

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15. Evaluate the following determinants by two method :

$$\begin{vmatrix} 1 & 2 & 4 \\ -1 & 3 & 0 \\ 4 & 1 & 0 \end{vmatrix}$$

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16. Evaluate the following determinants by two method :

$$\begin{vmatrix} 0 & 2 & 0 \\ 2 & 3 & 4 \\ 4 & 5 & 6 \end{vmatrix}$$

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17. Evalute the determinants in queations 1 and 2 :

If $A = \begin{vmatrix} 1 & 1 & -2 \\ 2 & 1 & -3 \\ 5 & 4 & -9 \end{vmatrix}$, find |A|.

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18. If $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}$, then show that : $|4A| = 64|A|$.

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19. $\begin{vmatrix} 1! & 2! & 3! \\ 2! & 3! & 4! \\ 3! & 4! & 5! \end{vmatrix} = ?$

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20. If $\begin{vmatrix} x+1 & 1 & 1 \\ 1 & x+1 & 1 \\ -1 & 1 & x+1 \end{vmatrix} = 0$, find the value of 'x'.

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Exercise 4 B Short Answer Type Questions

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

$|a - \; - \; - ab - \; - aa - bc - aa - \; - c| = 0$

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2. $\begin{vmatrix} 2 & a & abc \\ 2 & b & bca \\ 2 & c & cab \end{vmatrix}$

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3. Use properties of determinants to evaluate :

$$\begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix}$$

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4. Use properties of determinants to evaluate :

$$\begin{vmatrix} 102 & 18 & 36 \\ 1 & 3 & 4 \\ 17 & 3 & 6 \end{vmatrix}$$

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5. Use properties of determinants to evaluate :

$$\begin{vmatrix} 2 & 3 & 1 \\ 4 & 6 & 2 \\ 1 & 3 & 2 \end{vmatrix}$$

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6. Use properties of determinants to evaluate :

$$\begin{vmatrix} 2 & 3 & 5 \\ 261 & 127 & 388 \\ 20 & 30 & 50 \end{vmatrix}$$

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7. Show that $\begin{vmatrix} ma_1 & b_1 & nc_1 \\ ma_2 & b_2 & nc_2 \\ ma_3 & b_3 & nc_3 \end{vmatrix} = -mn\begin{vmatrix} c_1 & b_1 & a_1 \\ c_2 & b_2 & a_2 \\ c_3 & b_3 & a_3 \end{vmatrix}$

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8. Show that $x = 1$ is a root of the equation : $\begin{vmatrix} x+1 & 2x & 11 \\ 2x & x+1 & -4 \\ -3 & 4x-7 & 6 \end{vmatrix} =$

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9. If p, q, r are in A.P. Write the value of :

$\begin{vmatrix} x+1 & x+2 & x+p \\ x+2 & x+3 & x+q \\ x+3 & x+4 & x+r \end{vmatrix}$

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10. Show without expanding at any stage that:

$[(a, b, c], [a+x, b+2y, c+2z], [x, y, z] \mid = 0$

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11. Without expanding the determinant, show that the determinant

$$\begin{vmatrix} a^2+10 & ab & ac \\ ab & b^2+10 & bc \\ ac & bc & c^2+10 \end{vmatrix}$$ is divisible by 100

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Exercise 4 B Long Answer Type Questions I

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

$$\begin{vmatrix} 2 & 7 & 65 \\ 3 & 8 & 75 \\ 5 & 9 & 86 \end{vmatrix} = 0$$

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2. Without actual expansion, prove that the following determinants vanish :

$$\begin{vmatrix} a & b & c \\ a-b & b-c & c-a \\ b & c & a \end{vmatrix}$$

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3. Using the property of determinants and without expanding in questions 1 to 7 prove that ,

$$\begin{vmatrix} x & a & x+a \\ y & b & y+b \\ z & c & z+c \end{vmatrix} = 0$$

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4. Prove that $\begin{vmatrix} 1 & a & a^2-bc \\ 1 & b & b^2-ca \\ 1 & c & c^2-ab \end{vmatrix} = 0$

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5. witout expanding at any stage Prove that

$$\begin{vmatrix} 0 & a & -b \\ -a & 0 & -c \\ b & c & 0 \end{vmatrix} = 0$$

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6. Without actual expansion, prove that the following determinants vanish :

$$\begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix}$$

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7. The value of the determinant $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(a+c) \\ 1 & ab & c(a+b) \end{vmatrix}$ doesn't depend on

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8. Without expanding the determinants show that :

$\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+1\right)$ is a factor of : $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$

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9. Prove that : $\begin{vmatrix} x-y-z & 2x & 2x \\ 2y & y-z-x & 2y \\ 2z & 2z & z-x-y \end{vmatrix}$

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10. Without expanding the determinant, prove that

$|aa^2bc\hat{\ } 2ca\hat{\ } 2ab| = |1a^2a^31b^2b^31c^2c^3|$

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11. Show without expanding at any stage that:

$[0, \sin\alpha - \cos\alpha], [-\sin\alpha, 0, \sin\beta], [\cos\alpha s - \sin\beta, 0] \mid = 0$

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12. If $\begin{vmatrix} x^2+x & x+1 & x-2 \\ 2x^2+3x-1 & 3x & 3x-3 \\ x^2+2x+3 & 2x-1 & 2x-1 \end{vmatrix} = xA + B$ then

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13. Evaluate the following :

$$\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix}$$

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14. Evaluate the following :

$$\begin{vmatrix} x+\lambda & x & x \\ x & x+\lambda & x \\ x & x & x+\lambda \end{vmatrix}$$

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15. Evaluate the following: $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$

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16. Evaluate: $\begin{bmatrix} x & y & x+y \\ y & x+y & x \\ x+y & x & y \end{bmatrix}$

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17. Evaluate the following: $\begin{vmatrix} 1 & x & y \\ 1 & x+y & y \\ 1 & x & x+y \end{vmatrix}$

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18. Prove that: $\begin{vmatrix} b+c & c=a & a+b \\ q+r & r+p & p+q \\ y+z & z+x & x+y \end{vmatrix} = 2\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix}$

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19. Use the properties of determinant and without expanding prove that

$\begin{vmatrix} b+c & q+r & y+z \\ c+a & r+p & z+x \\ a+b & p+q & x+y \end{vmatrix}$.

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Exercise 4 B Long Answer Type Questions Ii

1. By using properties of determinants, prove the following: $|x+42x2x2 \times \ +42x2x2 \times \ +4| = (5x+4)(4-x)^2$

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2. Prove: $|x+4 \times \ \times \ +4 \times \ \times \ +4| = 16(3x+4)$

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3. Prove, using properties of determinants: $|y+kyyyy+kyyyy+k| = k^2(3y+k)$

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4. for $x, x, z > 0$ Prove that $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix} = 0$

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5. Prove that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

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6. Prove that

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

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7. Prove the following :

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

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8. Prove that : $\begin{vmatrix} 1 & x & x^3 \\ 1 & y & y^3 \\ 1 & z & z^3 \end{vmatrix}$

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9. Prove the following :

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ bc & ca & ab \end{vmatrix} = (a-b)(b-c)(c-a)$$

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10. $\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$ $=(a-b)(b-c)(c-a)$

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11. Prove the following :

$$\begin{vmatrix} bc & a & 1 \\ ca & b & 1 \\ ab & c & 1 \end{vmatrix} = (a-b)(b-c)(a-c)$$

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12. Prove the following :

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

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13. Prove the following :

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

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14. Prove that

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

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15. Prove the following :

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

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16. Prove the following :

$$\begin{vmatrix} \alpha & \alpha^2 & \beta+\gamma \\ \beta & \beta^2 & \gamma+\alpha \\ \gamma & \gamma^2 & \alpha+\beta \end{vmatrix} = \begin{vmatrix} \alpha & \beta & \gamma \\ \alpha^2 & \beta^2 & \gamma^2 \\ \beta+\gamma & \gamma+\alpha & \alpha+\beta \end{vmatrix} = (\beta-\gamma)(\gamma-\alpha)(\alpha-\beta)(\alpha +$$

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

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18. Evaluate the following: $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$

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19. Given : $a^2+b^2+c^2=0$

Prove the following :

$\begin{vmatrix} b^2+c^2 & ab & ca \\ ab & c^2+a^2 & bc \\ ca & bc & a^2+b^2 \end{vmatrix} = 4a^2b^2c^2$

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

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21. Prove the following :

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

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

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23. Prove that : $\begin{vmatrix} x+y+2z & x & y \\ z & y+z+2x & y \\ z & x & x+a+2y \end{vmatrix} = 2(x+y+)^3$

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24. Prove that

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

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25. Using properties of determinants, prove the following:

$$| \times \ + yx + 2y\ x + 2y \times \ + yx + yx + 2yx| = 9y^2(x+y)$$

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

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27. Prove the following :

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

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28. Prove the following : $\begin{vmatrix} 1 & x & x^2-yz \\ 1 & y & y^2-zx \\ 1 & z & z^2-xy \end{vmatrix} = 0.$

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29. For any scalar p prove that

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

.

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30. $\begin{vmatrix} x+y+z & -z & -y \\ -z & x+y+z & -x \\ -y & -x & x+y+z \end{vmatrix} = 2(x+y)(y+z)(z+x)$

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31. Prove: $|2yy-z-x2y2z2zz-x-yx-y-z2x2x| = (x+y+z)^3$

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32. $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$

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33. Show that:

$|3a-a+b-a+c-b+a3b-b+c-c+a-c+b3c| = 3(a+b+c)($

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34. 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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35. Solve: $|a+xa-xa-xa-xa+xa-xa-xa-xa+x| = 0$

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36. Prove that $\begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$ is independent of theta

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37. Prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$

=abc $\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$ hence find the value of the determinant, if a,b, and c are the roots of the equation $px^3 = qx^2 + rx - s = 0$.

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38. Prove that : $\begin{vmatrix} (y+z)^2 & x^2 & x^2 \\ y^2 & (x+z)^2 & y^2 \\ z^2 & z^2 & (x+y)^2 \end{vmatrix} = 2xyz(x+y+z)^3$

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39. 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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40. $\begin{vmatrix} (b+c)^2 & ab & ca \\ ab & (a+c)^2 & bc \\ ac & bc & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$

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41. Show that $\Delta = \left|(y+z)^2 xyz \times y(x+z)^2 yzxzyz(x+y)^2\right| = 2xyz(x+y+z)^3.$

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42. If a, b, c are positive and unequal, show that value of the determinant

$\Delta = \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is negative

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43. Using properties of determinants, prove that $|aa+ba+b+c2a3a+2b4a+3b+2c3a6a+3b10a+6b+3c| = a^3$

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44. Using properties of determinants. Prove that $|11+p1+p+q23+2p4+3p+2q36+3p10+6p+3q| = 1$

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45. Q. $\begin{vmatrix} x+y & x & x \\ 15x+4y & 4x & 2x \\ 10x+8y & 8x & 3x \end{vmatrix} = x^3$

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46. 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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47. Prove that

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

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48. If p, q, r are not in G.P. and $\begin{vmatrix} 1 & \frac{q}{p} & \alpha + \frac{q}{p} \\ 1 & \frac{r}{p} & \alpha + \frac{r}{q} \\ p\alpha + q & q\alpha + r & 0 \end{vmatrix} = 0$ Show that $p\alpha^2 + 2q\alpha + r = 0$

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Exercise 4 C Short Answer Type Questions

1. The value of $\begin{vmatrix} a_1x_1 + b_1y_1 & a_1x_2 + b_1y_2 & a_1x_3 + b_1y_3 \\ a_2x_1 + b_2y_1 & a_2x_2 + b_2y_2 & a_2x_3 + b_2y_3 \\ a_3x_1 + b_3y_1 & a_3x_2 + b_3y_2 & a_3x_3 + b_3y_3 \end{vmatrix}$, is

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2. The value of $\begin{vmatrix} 2y_1z_1 & y_1z_2 + y_2z_1 & y_1z_3 + y_3z_1 \\ y_1z_2y_2z_1 & 2y_2z_2 & y_2z_3 + y_3z_2 \\ y_1z_3 + y_3z_1 & y_2z_3 + y_3z_2 & 2y_3z_3 \end{vmatrix}$, is

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3. If $\Delta = \begin{vmatrix} \cos(\alpha_1 - \beta_1) & \cos(\alpha_1 - \beta_2) & \cos(\alpha_1 - \beta_3) \\ \cos(\alpha_2 - \beta_1) & \cos(\alpha_2 - \beta_2) & \cos(\alpha_2 - \beta_3) \\ \cos(\alpha_3 - \beta_1) & \cos(\alpha_3 - \beta_2) & \cos(\alpha_3 - \beta_3) \end{vmatrix}$ then Δ equals

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4. If $l_1, m_1, n_1, l_2, m_2, n_2$ and l_3, m_3, n_3 are direction cosines of three mutuallyy perpendicular lines then, the value of $\begin{vmatrix} l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \\ l_3 & m_3 & n_3 \end{vmatrix}$ is

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Exercise 4 D Short Answer Type Questions

1. 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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2. Using determinant, find the area of the triangle with vertices :

$(1, \ -1), (2, 4), (-3, 5)$

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3. Find the area of the triangle with vertices at the points given in each of the following . Are the following points collinear ?

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

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4. Find area the triangle with at the point given in each of the following

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

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Exercise 4 D Long Answer Type Questions

1. Find the area of the triangle with vertices at the points given in each of the following . Are the following points collinear ?

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

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2. Using determinants , show that the following points are collinear :

$(11, 7), (5, 5)$ and $(-1, 3)$.

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3. Use determinants to show that the following points are collinear.

(i) A(2, 3), B(-1, -2) and C(5, 8)

(ii) A(3, 8), B(-4, 2) and C(10, 14)

(iii) P(-2, 5), Q(-6, -7) and R(-5, -4)

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4. If the points (3, -2), $(x, 2)$ and (8 ,8) are collinear, find x using determinant.

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

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6. If area of ΔABC is 12 square units and vertices are $A(x, 2)$, $B(4, -1)$ and $C(-3, 7)$, then find the value of x.

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7. Find the values of 'k' if area of the triangle is 4 square unts and vertices are $(2, 0), (0, 4), (0, k)$.

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8. Find the values of k if area of triangle is 4 sq. units and vertices are: (k,0),(0,2)(4,0)`

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9. Determine the value of 'x' for which the area of the triangle formed by joining the points $(x, 4), (0, 8)$ and $(-1, 3)$ will be $4\frac{1}{2}$ square units.

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10. Find the equation of the line joining the following points, using determinants :

$(1, 2)$ and $(3, 6)$

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

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

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12. 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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13. Prove that the area of the triangle whose vertices are :

$\left(at_1^2, 2at_1\right), \left(at_2^2, 2at_2\right), \left(at_3^2, 2at_3\right)$ is $a^2(t_1 - t_2)(t_2 - t_3)(t_3 - t_1)$.

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

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15. If the points $(a_1, b_1)m(a_2, b_2)$ and $(a_1 - a_2, b_2 - b_2)$ are collinear, then prove that $\frac{a_1}{a_2} = \frac{b_1}{b_2}$

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16. If $P(x, y)$ is any point on the line joining the point $A(a, 0)andB(0, b)$, then show that $\frac{x}{a} + \frac{y}{b} = 1.$

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17. An equilateral triangle has each side to a. If the coordinates of its vertices are $(x_1, y_1), (x_2, y_2)$ and (x_3, y_2) and (x_3, y_3) then the square of the determinat $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$ equals

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Exercise 4 E Short Answer Type Questions

1. Find all the co-factors of $\begin{vmatrix} 1 & 3 \\ -2 & 4 \end{vmatrix}$

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

(i) $|2 - 403|$ (ii) $|acbd|$

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

(i) $|2 - 403|$ (ii) $|acbd|$

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4. In the determinant $\begin{vmatrix}5 & -1 & 4\\ 2 & 3 & -5\\ -1 & -2 & 6\end{vmatrix}$, find the co-factos of the elements $-5, 3$ and 6

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5. Write the minor and cofactor of each element of the following determinants and also evaluate the determinant in each case: $\begin{vmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{vmatrix}$

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6. Find the minor and cor-factor of each element of the first column of the following determinants :

$\begin{vmatrix}0 & 2 & 6\\ 1 & 5 & 0\\ 3 & 7 & 1\end{vmatrix}$

Hence or otherwise evaluate them.

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7. Find the minor and co-factor of each element of the first column of the following determinants :

$$\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$$

Hence or otherwise evaluate them.

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8. Write the minor and cofactor of each element of the following determinants and also evaluate the determinant in each case: $\begin{vmatrix} 5 & -10 \\ 0 & 3 \end{vmatrix}$

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9. Write the minor and cofactor of each element of the following determinants and also evaluate the determinant in each case:

$$\begin{vmatrix} 1 & 3 & -2 \\ 4 & -5 & 6 \\ 3 & 5 & 2 \end{vmatrix}$$

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10. Write mitros and cofactros of the elements of the following determinants:

$$\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$$

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

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11. Using Cofactors of elements of third column, evaluate $\Delta = |1xyz1yzx1zxy|$

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12. Write down the co-factors of the elements of the first row of the following determinant and hence evaluate the determinant

$$\begin{vmatrix} 1 & 3 & -3 \\ 2 & -1 & 0 \\ 4 & -2 & 5 \end{vmatrix}$$

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13. Find minors and co-factors of the elements of the determinant :

$$\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$$

and verify that $a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33} = 0$

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Exercise 4 F Short Answer Type Questions

1. Solve the following system of linear equations by Cramers rule: $3x + ay = 4, \quad 2x + ay = 2, \quad a \neq 0$

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2. With the help of determinants , solve the following systems of equations :

$2x + 3y = 9, 3x - 2y = 7$

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3. With the help of determinants , solve the following systems of equations :

$2x - y = -2, 3x + 4y + 8 = 0$

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4. Solve the following system of equations by matrix method: $3x + y = 19, \; 3x - y = 23$

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5. Classify the following system of equations as consistent or inconsistent

. If consistent, solve them :

$x + y = -1, 2x - 3y = 8$

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6. Classify the following system of equations as consistent or inconsistent

. If consistent, solve them :

$3x - 2y = 4, 6x - 4y = 10$

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7. Classify the following system of equations as consistent or inconsistent

. If consistent, solve them :

$x + 2y = 5, 3x + 6y = 15$

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8. Use Cramer's rule to show that the following system of equations has infinite number of solutions

$2x - 3y - z = 0, x + 3y - 2z = 0, x - 3y = 0$

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9. Solve the following system of equations, using Cramer'e rule :

$x + y + 3z = 6, x - 3y - 3z = -4, 5x - 3y + 3z = 8$

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10. Show that the following systems of linear equations are inconsistent:

$3x + y = 5, \quad -6x - 2y = 9$

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11. Show that the following systems of linear equations are inconsistent:

$2x - y = 5, \ \ 4x - 2y = 7$

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12. Find a quadratic function defined by the equation :

$f(x) = ax^2 + bx + c$

if $(i) f(1) = 0, f(2) = -2$ and $f(3) = -6$

$(ii) f(0) = f(-1) = 0$ and $f(1) = 2$

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13. The system of equations $\lambda x + y + z = 0, \ -x + \lambda y + z = 0, \ -x - y + \lambda z = 0$ will have a non-zero solution if real values of λ are given by

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Exercise 4 F Long Answer Type Questions

1. Solve the following system of equations by Cramer's Rule :

$x + 3y = 4, y + 3z = 7, 4x + z = 6$

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2. Solve the following system of equations by Cramer's Rule :

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

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3. Solve the following system of equations by Cramer's Rule :

$3x + y + z = 10, x + y + z = 0, 5x - 9y = 1.$

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4. Solve the following system of equations by Cramer's Rule :

$$(b + c)(y + z) - zx = b - c$$
$$(c + a)(z + x) - by = c - a$$
$$(a + b)(x + y) - cz = a - b$$

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5. Classify the following system of equations as consistent or inconsistent. If consistent, then solve them :

$x - y + 3z = 6, x + 3y - 3z = -4, 5x + 3y + 3z = 14$

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6. Classify the following system of equations as consistent or inconsistent. If consistent, then solve them :

$x + y + 4z = 6, 3x + 2y - 2z = 9, 5x + y + 2z = 13$

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7. Classify the following system of equations as consistent or inconsistent. If consistent, then solve them :

$2x + 5y - z = 9, 3x - 3y + 2z = 7, 2x - 4y + 3z = 1$

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8. Solve the following system of homogenous linear equations :

$2x+3y+4z=0, x+y+z=0, 2x-y+3z=0$

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9. Solve the following system of homogenous linear equations :

$x+y-z=0, x-2y+z=0, 3x+6y-5z=0$

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10. The system of equations:

$x+ky+3z=0,\ 3x+ky-2z=0,\ 2x+3y-4z=0$ has non- trivial solution. when $k=$

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11. Find the cost of sugar and wheat per kg, if the cost of $7kg$.of sugar and $3kg$.of wheat is ₹240 and cost of $7kg$ of wheat and $3kg$.of sugar is ₹160. (Use determinants)

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12. Represent the following problem by a system of equations :

$''$₹240 is the cost of $5kg$ sugar, $5kg$ of wheat and $2kg$ of rice. The cost of $4kg$ rice $2kg$ sugar and $5kg$ wheat is ₹190. The cost of $3kg$ wheat $2kg$ rice and $4kg$ sugar is ₹190". Use determinants to find the cost of each per kg.

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Exercise 4 G Short Answer Type Questions

1. Verify $A(adj.\ A) = (adj.\ A)A = |A|I$:

$$\begin{bmatrix} 2 & 3 \\ -4 & -6 \end{bmatrix}$$

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2. Verify $A(adj.\ A)=(adj.\ A)A=|A|I$:

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

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3. Verify that $A(adjA)=I$ when :

$$A=\begin{bmatrix}\cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1\end{bmatrix}$$

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4. Find the inverse of each of the following matrice :

$$\begin{bmatrix}-1 & 5 \\ -3 & 2\end{bmatrix}$$

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5. Find the inverse of each of the following matrice :

$$\begin{bmatrix} 2 & -2 \\ 4 & 3 \end{bmatrix}$$

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6. If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$, verify $A^2 - 4A + 3I = 0$, where $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $O = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$. Hence find A^{-1}.

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

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8. Consider the matrix $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$.

Show that $A^2 - 7A - 2I = O$

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9. Consider the matrix $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$.

Hence , find A^{-1}.

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10. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$, write A^{-1} in terms of A.

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11. Verify $(AB)^{-1} = B^{-1}A^{-1}$ for the matrices A and B where

$A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$

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12. Verify $(AB)^{-1} = B^{-1}A^{-1}$ for the matrices A and B where

$A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 8 \\ 7 & 9 \end{bmatrix}$

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13. Verify $(AB)^{-1} = B^{-1}A^{-1}$ for the matrices A and B where

$A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 7 \\ 8 & 9 \end{bmatrix}$

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14. Verify $(AB)^{-1} = B^{-1}A^{-1}$ for the matrices A and B where

$A = \begin{bmatrix} 4 & 1 \\ 6 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 5 \\ 1 & 6 \end{bmatrix}$

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15. Show that the matrix $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ satisfies the equation $A^2 - 4A + I = O$ and hence, find A^{-1}.

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16. If $A=\begin{bmatrix}2 & -1\\ 1 & 3\end{bmatrix}$, then show that $A^2-5A+7I_2=O$, hence find A^{-1}.

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17. If $A=[31-12]$, show that $A^2-5A+7I=O$. Hence, find A^{-1}.

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18. For the matrix $A=\begin{bmatrix}2 & 1\\ 3 & 0\end{bmatrix}$, find the numbers 'a' and 'b' such that $A^2+aA+bI=O$. Hence , find A^{-1}.

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19. If $A=\begin{bmatrix}2 & -3\\ -4 & 7\end{bmatrix}$, compute A^{-1} and show that $2A^{-1}+A-9I=O$.

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Exercise 4 G Long Answer Type Questions

1. Find the inverse of the matrix $\begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix}$ Hence, find the matrix P satisfying the matrix equation :

$$P\begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$$

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2. Find the inverse the matrix (if it exists)given in$[1 - 1202 - 33 - 24]$

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3. Find the inverse of each of the following :

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 4 \\ 0 & 0 & 5 \end{bmatrix}$$

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4. Find the inverse of each of the following :

$$\begin{bmatrix} 2 & 1 & 3 \\ 4 & -1 & 0 \\ -7 & 2 & 1 \end{bmatrix}$$

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5. Find the inverse of each of the following :

$$\begin{bmatrix} 1 & 0 & 0 \\ 3 & 3 & 0 \\ 5 & 2 & -1 \end{bmatrix}$$

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6. If $P = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$, find P^{-1}. Verify that $\mathrm{PP}^{-1} = I$

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7. Given $A = \begin{bmatrix} 5 & 0 & 4 \\ 2 & 3 & 2 \\ 1 & 2 & 1 \end{bmatrix}, B^{-1} = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$. Compute $(AB)^{-1}$.

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8. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, prove that $A^2 - 4A - 5I = O$ and hence, obtain A^{-1}.

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9. If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$. find $A^2 - 5A + 6I$ and hence , find a matrix X such that $A^2 - 5A + 6I + X = O$.

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10. Find AB, if $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 \\ 1 & 2 \\ 1 & -2 \end{bmatrix}$. Examine whether $(AB)^{-1}$ exist or not.

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11. Verify : $A(adj.\ A) = (adj.\ A)A = |A|I$ when :

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

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12. Verify : $A(adj.\ A) = (adj.\ A)A = |A|I$ when :

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

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13. Verify : $A(adj.\ A) = (adj.\ A)A = |A|I$ when :

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

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14. Verify : $A(adj.\ A) = (adj.\ A)A = |A|I$ when :

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

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15. Find the inverse of the matrix $A = \left[abc\frac{1+bc}{a}\right]$ and show that $aA^{-1} = (a^2 + bc + 1)I - aA$.

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Exercise 4 H Short Answer Type Questions

1. Classify the following system of equations as consistent or inconsistent

:

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

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2. Classify the following system of equations as consistent or inconsistent

:

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

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3. Classify the following system of equations as consistent or inconsistent

:

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

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4. Solve the following equations using inverse of a matrix.

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

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5. Solve the following equations using inverse of a matrix.

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

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6. Solve the following equations using inverse of a matrix.

$$2x + 3y = 4$$
$$4x + 5y = 6$$

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7. Solve the following equations using inverse of a matrix.

$$2x + 5y = 1$$
$$3x + 2y = 7$$

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8. Solve system of linear equations, using matrix method, $5x + 2y = 4$

$7x + 3y = 5$

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9. Solve system of linear equations, using matrix method, $4x3y = 3$

$3x5y = 7$

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10. Solve the following equations using inverse of a matrix.

$x + y = 5, y + z = 3, z + x = 4$

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Exercise 4 H Long Answer Type Questions

1. Classify the following system of equations as consistent or inconsistent

:

$$x + y + z = 1$$
$$2x + 3y + 2z = 2$$
$$ax + ay + 2az = 4$$

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2. Show that following system of linear equations is inconsistent:

$3x - y - 2z = 2, \; 2y - z = -1, \; 3x - 5y = 3$

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3. Examine the consistency of the system of equations in questions 1 to 6.

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

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4. Classify the following system of equations as consistent or inconsistent :

$$5x - 6y + 4z = 15$$
$$7x + 4y - 3z = 19$$
$$2x + y + z = 46$$

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5. Solve the following system of equations by matrix method :

$x + y - z = 3, 2x + 3y + z = 10, 3x - y - 7z = 1$

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6. Using matrices, solve the following system of equations:

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

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7. Solve the following system of equations, using matrix method.

$x + 2y + z = 7, x + 3z = 11, 2x - 3y = 1$

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8. Using matrices, solve the following system of equations for x,y and z.

$$x + 2y + z = 8$$
$$2x + y - z = 1$$
$$x - y + z = 2$$

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9. Using matrices, solve the following system of equations:

$2x = 3y + 5z = 11\ 3x + 2y - 4z = \ -5$

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10. Solve the following system of linear equations by matrix method:

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

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11. Using matrices, solve the following system of equations for x,y and z.

$x + y + z = 3, y + 3z = 4, x - 2y + z = 0$

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12. Using matrices, solve the following system of equations for x,y and z.

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

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13. Using matrices, solve the following system of equations for x,y and z.

$2x + 3y + 3z = 5, x - 2y + z = -4, 3x - y - 2z = 3$

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14. Using matrices, solve the following system of equations for x,y and z.

$3x - 2y + 3z = 8{,}2x + y - z = 1, 4x - 3y + 2z = 4$

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15. Using matrices, solve the following system of equations for x,y and z.

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

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16. Solve system of linear equations, using matrix method, in questions 7 to 14.

x-y+2z=7, 3x+4y-5z=-5, 2x-y+3z=12

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17. Solve the following equations, using inverse of a matrix :

$x - 2y + 3z = -5$

$3x + y + z = 8$

$2x - y + 2z = 1$

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18. Solve the following equations, using inverse of a matrix :

$x + 2y = 5$

$y + 2z = 8$

$z + 2x = 5$

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19. Find inverse of matrix, solve the equation $x - y + z = 4$, $2x + y - 3z = 0$, $x + y + z = 2$

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20. Solve the following equations, using inverse of a matrix :

$$x + 2y - 3z = -4$$
$$2x + 3y + 2z = 2$$
$$3x - 3y - 4z = 11$$

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21. 2x+3y+5z=16,

3x+ 2y-4z= 4,

x + y - 2z =- 3.

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22. Solve the following equations, using inverse of a matrix :

$$2x + y + z = 1$$
$$2x - 4y - 2x = 3$$
$$3y - 5z = 9$$

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23. Solve the following equations, using inverse of a matrix :

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

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24. Solve the following equations, using inverse of a matrix :

$$3x + 4y + 7z = 4$$
$$2x - y + 3z = -3$$
$$x + 2y - 3z = 8$$

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25. Solve the following equations, using inverse of a matrix :

$$8x + 4y + 3z = 18$$
$$2x + y + z = 5$$
$$x + 2y + z = 5$$

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26. Solve the following equations, using inverse of a matrix :

$x + y + z = 6$

$y + 3z = 11$

$x - 2y + z = 0$

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27. Solve the following equations, using inverse of a matrix :

$5x - y + z = 4$

$3x + 2y - 5z = 2$

$x + 3y - 2z = 5$

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28. Solve the following equations, using inverse of a matrix :

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

$2x + y - z = 1$

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

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29. Solve the following equations, using inverse of a matrix :

$$3x - y + z = 5$$
$$2x - 2y + 3z = 7$$
$$x + y - z = -1$$

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30. Solve the following equations, using inverse of a matrix :

$$4x + 3y + z = 10$$
$$3x - y + 2z = 8$$
$$x - 2y - 3z = -10$$

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31. $\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4, \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1, \frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2$

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32. Solve the following system of equations :

$$\frac{1}{x}-\frac{1}{y}+\frac{2}{z}=7$$
$$\frac{3}{x}+\frac{4}{y}-\frac{5}{z}=-5$$
$$\frac{2}{x}-\frac{1}{y}+\frac{3}{z}=12$$

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33. Solve the following system of equations :

$$\left(\frac{1}{x}-\frac{1}{y}+\frac{2}{z}=4,,\right),\left(\frac{2}{x}+\frac{1}{y}-\frac{3}{z}=0,,\right),\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=2,x,y,\right.$$

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34. If $A=(2-3532-411-2)$, find A^{-1}. Using A^{-1} solve the following system of equations:

$2x-3y+5z=16;\ 3x+2y-4z=-4;\ x+y-2z=-3$

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35. 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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36. If $A = \begin{bmatrix} 3 & 2 & 1 \\ 4 & -1 & 2 \\ 7 & 3 & -3 \end{bmatrix}$ then find A^{-1} and hence solve the following system of equations :

$3x + 4y + 7z = 14, 2x - y + 3z = 4 \text{ and } x + 2y - 32 = 0.$

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37. If $A = \begin{bmatrix} 3 & 1 & 2 \\ 3 & 2 & -3 \\ 2 & 0 & -1 \end{bmatrix}$, find A^{-1}. Hence, solve the system of equations :

$3x + 3y + 2z = 1, x + 2y = 4,$ 2x-3y-z=5`

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38. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 2 \\ 3 & 1 & 1 \end{bmatrix}$, find A^{-1}. Hence, solve the system of equations :

$x + y + z = 6, x + 2z = 7, 3x + y + z = 12$

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39. 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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40. Given that $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$. Find AB.

Use this to solve that following system of equations :

$x - y = 3, 2x + 3y + 4z = 17, y + 2z = 7.$

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41. Given $A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}$,

find AB and use this result in solving the following system of equation

x-y+z=4,

x-2y-2z=9

2x+2y+3z=1

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

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43. Solve the following system of homogeneous equations: $2x + 3y - z = 0\ x - y - 2z = 0\ 3x + y + 3z = 0$

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44. Solve the following system of homogeneous linear equations by matrix method: $3x + y - 2z = 0, \ \ x + y + z = 0, \ \ x - 2y + z = 0$

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45. Solve following system of homogeneous linear equations: $x + y - 2z = 0, \ \ 2x + y - 3z = 0, \ \ 5x + 4y - 9z = 0$

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46. Solve the following system of homogeneous equations: $x + y + z = 0 \ x - 2y + z = 0 \ 3x + 6y - 5z = 0$

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47. A school wants to award its students for the value of honesty, regularity and hard work will total cash award of Rs. 6000. Three times the award money for hard work added to that added to that given for honesty amounts to Rs. 11000. The award money given for honesty and hard work together is double the one given for regularity. Represent the above situation algebraically and find the award money for each value, using matrix method.

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48. Two schools A and B want to awad their selected students on the values of sincerity, truthfulness and helpfulness. The school A wants to award ₹x each , ₹y each and ₹z each for the three respective values to $3, 2$ and 1 students respectively with a total award money of ₹1600. School B wants to spend ₹2300 to award its $4, 1$ and 3 students on the respective values (by giving the same award money to the three values as before). If the total amount of award for one prize on each value is ₹900, using matrices, find the award money for each value.

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49. Two schools P and Q want to award their selected students on the values of Discipline, politeness and punctuality. The school P wants to awards Rs. x each, Rs. y each and Rs. z each for the three respective values to its 3, 2 and 1 students with a total award money of Rs. 1000. School Q wants to spend Rs 1500 to award its 4, l and 3 students on the respective values (by giving the same award money for the three values before) If the total amount of awards for one prize on each value is Rs. 600, using matrices, find the award money for each value. Apart from the above three values suggest one more value for awards.

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50. The sum of three numbers is 6. If we multiply third 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. Represent it algebraically and find the numbers using matrix method.

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51. The sum of three numbers is 6. Twice the third number when added to the first number gives 7. On adding the sum of the second and the third numbers to thrice the first number, we get 12. Find the numbers by using matrix method.

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52. 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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Objective Type Questions Multiple Choice Question

1. Evalute the determinants in queations 1 and 2 :

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

0

A. 6

B. ± 6

C. -6

D. $6, 6$

Answer: A

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2. 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) $3k|A|$

A. $k|A|$

B. $k^2|A|$

C. $k^3|A|$

D. $3k|A|$

Answer: C

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3. 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

Answer: C

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4. 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) $12, 2$

A. 12

B. -2

C. $-12, -2$

D. $12, -2$

Answer: D

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5. If $A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$ and A_{ij} is co-factos of a_{ij}, then A is given by :

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

B. $a_{11}A_{11} + a_{12}A_{21} + a_{13}A_{33}$

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

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

Answer: B

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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) $3|A|$

A. $|A|$

B. $|A|^2$

C. $|A|^3$

D. $3|A|$

Answer: B

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

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

A. $\det(A)$

B. $\frac{1}{\det(A)}$

C. 1

D. 0

Answer: A

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8. Choose the correct answer in questions 17 to 19:

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

A. 0

B. 1

C. x

D. $2x$

Answer: A

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9. Choose the correct answer

If x, y, z are nonzero 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. $\dfrac{1}{xyz} \begin{bmatrix} x^{-1} & 0 & 0 \\ 0 & y^{-1} & 0 \\ 0 & 0 & z^{-1} \end{bmatrix}$

D. $\dfrac{1}{xyz} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Answer: A

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10. Let $A = \begin{bmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{bmatrix}, where 0 \leq \theta < 2\pi$ then (A) $|A| = 0$ (B) $|A| \varepsilon [2, 4]$ (C) $|A| \varepsilon)(0, \infty)$ (D) $|A| \varepsilon (2, \infty)$

A. $Det(A) = 0$

B. $Det(A) \varepsilon (2, \infty)$

C. $Det(A) \varepsilon (2, 4)$

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

Answer: D

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11. If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$ then the value of x is

A. 3

B. ± 3

C. ± 6

D. 6

Answer: C

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12. Let $\Delta_1 = \begin{vmatrix} Ax & x^2 & 1 \\ By & y^2 & 1 \\ Cz & z^2 & 1 \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} A & B & C \\ x & y & z \\ yz & zx & xy \end{vmatrix}$, then :

A. $\Delta_1 = -\Delta$

B. $\Delta \neq \Delta_1$

C. $\Delta - \Delta_1 = 0$

D. None of these

Answer: C

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13. If $x, y \in R$, then the determinant $= |\cos x - \sin x 1 \sin x \cos x 1 \cos(x+y) - \sin(x+y) 0|$ lies in the interval $\left[-\sqrt{2}, \sqrt{2}\right]$ (b) $[-1, 1]$ $\left[-\sqrt{2}, 1\right]$ (d) $\left[-1, -\sqrt{2}\right]$

A. $\left[-\sqrt{2}, \sqrt{2}\right]$

B. $[-1, 1]$

C. $\left[-\sqrt{2}, 1\right]$

D. $\left[-1, -\sqrt{2}\right]$

Answer: B

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14. If the area of a triangle with vertices $(-3, 0)$, $(3, 0)$ and $(0, 0$ is 9 sq. units. Then the value of k will be

A. 9

B. 3

C. -9

D. 6

Answer: B

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15. If A, B and C are angles of a triangle then the determinant $\begin{vmatrix} -1 & \cos C & \cos B \\ \cos C & -1 & \cos A \\ \cos B & \cos A & -1 \end{vmatrix}$ is equal to

A. 0

B. -1

C. 1

D. None of these

Answer: A

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16. If A is a sqaure matrix of order 3×3 and $|A| = 5$, then $|adj. A|$ is

A. 5

B. 125

C. 15

D. 25

Answer: D

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17. The value of 'x' for which $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$ is

A. $\pm 2\sqrt{3}$

B. $\pm 3\sqrt{3}$

C. $\pm 2\sqrt{2}$

D. None of these

Answer: C

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18. Evalute the determinants in queations 1 and 2 :

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

0

A. 6

B. ± 6

C. -6

D. 0

Answer: B

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19. If A is a matrix of order 3×3 and $|A| = 10$, then $|adj. A|$ is

A. 0

B. 10

C. 100

D. 1000

Answer: C

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

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

A. $\det A$

B. $\frac{1}{\det(A)}$

C. 1

D. 0

Answer: A

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21. If $\begin{vmatrix} 2 & 3-x \\ 1 & 4 \end{vmatrix} = 0$, then value of 'x' is

A. 3

B. -3

C. 5

D. -5

Answer: D

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22. If $\begin{vmatrix} x & 12 \\ 3 & x \end{vmatrix} = \begin{vmatrix} 6 & 18 \\ 2 & 6 \end{vmatrix}$, then value of 'x' is

A. ± 4

B. ± 6

C. ± 8

D. None of these

Answer: B

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23. Let A be a non-singular square matrix of order 3×3. Then |adj A| is equal to (a) $|A|$ (B) $|A|^2$ (C) $|A|^3$ (D) $3|A|$

A. $|A|^3$

B. $|A|$

C. $3|A|$

D. $|A|^2$

Answer: D

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24. If A and B are invertible matrices of the same order, then $(AB)'$ is equal to

A. $A'B'$

B. $B'A'$

C. $-A'B'$

D. $-B'A'$

Answer: B

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25. If determinant A is order 2×2 and $|A| = 3$, then the value of $|2A|$ is

A. 6

B. 12

C. -6

D. None of these

Answer: B

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Objective Type Questions Fill In The Blanks

1. If $\begin{vmatrix} x & 2 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 9 & 6 \end{vmatrix}$, then the value of 'x' is ....

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2. Let A be a 3×3 determinant and $|A| = 7$. Then the value of $|2A|$ is............

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3. If $A = \begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$, then the value of $k =$ ________if $|2A| = k|A|$.

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4. If A is a skew-symmetric matrix of order 3, then $\det A =$ _______

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5. The value of $\begin{bmatrix} 102 & 18 & 36 \\ 1 & 3 & 4 \\ 17 & 3 & 6 \end{bmatrix}$ is ____________

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6. If $\Delta = \begin{vmatrix} 1 & a \\ 1 & b \end{vmatrix}$, then minor of 'b' is _______

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7. Minor of 'd' in $\begin{vmatrix} a & c \\ b & d \end{vmatrix}$ is _________

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8. Co-facotr of 'b' in $\begin{vmatrix} a & c \\ b & d \end{vmatrix}$ is ___________

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9. If $\Delta = \begin{vmatrix} 1 & 2 & 3 \\ 2 & 0 & 1 \\ 5 & 3 & 8 \end{vmatrix}$, then minor of a_{22}=__________

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10. A square matrix A has inverse if and only if A is ....

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Objective Type Questions True Or False

1. If $\begin{bmatrix} x & 2 \\ 18 & x \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 18 & 6 \end{bmatrix}$, then 'x' is equal to ± 6.

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

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3. 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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4. If any two rows (or columns) of a determinant are identical, the value of the determinant is zero.

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5. If A; B are invertible matrices of the same order; then show that $(AB)^{-1} = B^{-1}A^{-1}$

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Objective Type Questions Very Short Answer Type Question

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

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2. Evaluate : $\begin{vmatrix} -2 & 3 \\ 4 & -9 \end{vmatrix}$

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3. $\begin{vmatrix} \cos 70^\circ & \sin 20^\circ \\ \sin 70^\circ & \cos 20^\circ \end{vmatrix} = ?$

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4. Evaluate $\begin{vmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 75^\circ & \cos 75^\circ \end{vmatrix}$

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5. Evaluate : $\begin{vmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{vmatrix}$

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

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7. $\begin{vmatrix} x^2-x+1 & x-1 \\ x+1 & x+1 \end{vmatrix}$

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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. Let A be a square matric of order 3×3 . Write the value of $2A$, where $A = 4$.

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10. If A and B are square matrices of same order 3 , such that $|A| = 2$ and $AB = 2I$, write the value of $|B|$

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11. Find the co-factor of the element a_{23} of the determinant $\begin{vmatrix} 5 & 3 & 5 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{vmatrix}$

Watch Video Solution

12. Write the minor of 6 in $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$

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13. Write the co-factor of 7 in $\begin{vmatrix} 4 & 5 & 6 \\ 5 & 6 & 7 \\ 13 & 15 & 17 \end{vmatrix}$

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14. For what value of x , is the following matrix singular ?

$$\begin{bmatrix} 3-2x & x+1 \\ 2 & 4 \end{bmatrix}$$

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15. For what value of x, the matrix $[5 - \times + 124]$ is singular?

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16. For what value of 'x' the matrix $\begin{bmatrix} 2-x & 3 \\ -5 & -1 \end{bmatrix}$ is not invertible ?

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17. Find the adjoint of the following matrices :

$$\begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$$

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18. Find the adjoint of each of the matrices in questions 1 and 2.

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

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19. Find the adjoint of the following matrices :

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

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20. If $A = \begin{bmatrix} 3 & 1 \\ 2 & -3 \end{bmatrix}$, then find $|adj.\ A|$.

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21. If $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ then A^{-1} =?

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22. If A is a square matrix of order 3 with $|A| = 9$, then write the value of $|2.\ adj.\ A|$.

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23. If A is a square matrix with $|A| = 8$, then find the value of $|AA'|$.

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24. If A is a 3 × 3 invertible matrix, then what will be the value of k if det(A–1) = (det A)k .

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25. Write A^{-1} for $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$.

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26. if for any 2×2 square matrix A , $A(adjA) = \begin{bmatrix} 8 & 0 \\ 0 & 8 \end{bmatrix}$ then write the value of $\det(A)$

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Ncert File Exercise 4 1

1. Evaluate the determinants in $|24 - 5 - 1|$

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2. Evaluate the determinants in $\begin{vmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{vmatrix}$

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3. $\begin{vmatrix} x^2 - x + 1 & x - 1 \\ x + 1 & x + 1 \end{vmatrix}$

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4. Evalute the determinants in queations 1 and 2 :

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

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5. If $A = [101012004]$, then show that $|3A| \quad = \quad 27|A|$

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6. Evalute 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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7. Evalute 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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8. Evalute 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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9. Evalute 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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10. Evalute the determinants in queations 1 and 2 :

If $A = \begin{vmatrix} 1 & 1 & -2 \\ 2 & 1 & -3 \\ 5 & 4 & -9 \end{vmatrix}$, find |A|.

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11. Evalute the determinants in queations 1 and 2 :

Find the 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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12. Evalute the determinants in queations 1 and 2 :

Find the 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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13. Evalute the determinants in queations 1 and 2 :

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

0

A. 6

B. ± 6

C. -6

D. 0

Answer: B

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Ncert File Exercise 4 2

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

$|xax + ayby + bzcz + c| = 0$

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

$|a - \; - \; - ab - \; - aa - bc - aa - \; - c| = 0$

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

$$\begin{vmatrix} 2 & 7 & 65 \\ 3 & 8 & 75 \\ 5 & 9 & 86 \end{vmatrix} = 0$$

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

$|1bca(b + c)1cab(c + a)1abx(a + b)| = 0$

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5. Use the properties of determinant and without expanding prove that

$$\begin{vmatrix} b+c & q+r & y+z \\ c+a & r+p & z+x \\ a+b & p+q & x+y \end{vmatrix}.$$

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6. By using properties of determinants in $\begin{vmatrix} 0 & a & -b \\ -a & 0 & -c \\ b & c & 0 \end{vmatrix} = 0$

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7. Using properties of determinants, prove that

$$\left| -a^2abacba - b^2bacb - c^2 \right| = 4a^2b^2c^2$$

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8. Prove that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

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9. Prove that:

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

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

(iii) $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$

(iv) If $\begin{vmatrix} 1 & a^2 & a^4 \\ 1 & b^2 & b^4 \\ 1 & c^2 & c^4 \end{vmatrix} = (a+b)(b+c)(c+a) = \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$

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

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11. By using properties of determinants. Show that: (i) $|x+42x2x2\times +42x2x2\times +4| = (5x-4)(4-x)^2$ (ii) $|y+kyyyy+kyyyy+k| = k^2\left(2y\dot{k}\right)^2$

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12. Prove, using properties of determinants: $|y+kyyyy+kyyyy+k| = k^2(3y+k)$

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13. Prove that: $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$

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14. Prove that

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

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15. By using properties of determinants. Show that:

$$\left|1\times^2 x^2 1\times x^2 1\right| = \left(1-x^3\right)^2$$

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16. 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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17. Using properties of determinants, prove the following: $\left|a^2 abaca \hat{} \ 2 + 1bacbc^2 + 1\right| = 1 + a^2 + b^2 + c^2.$

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18. 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) $3k|A|$

A. $k|A|$

B. $k^2|A|$

C. $k^3|A|$

D. $3k|A|$

Answer: C

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19. 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

Answer: C

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Ncert File Exercise 4 3

1. 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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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. Find area of the triangle with vertices at the points given in each of the following

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

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

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5. Find the values of k if area of tringle is 4 sq. units and dvertices are :

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

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

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6. Find the values of k if area of triangle is 4 sq. units and vertices are: (-2,0),(0,4)(0,k)`

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7. (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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8. (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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9. 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. $12, -2$

Answer: D

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Ncert File Exercise 4 4

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

(i) $|2 - 403|$ (ii) $|acbd|$

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

(i) $|2 - 403|$ (ii) $|acbd|$

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3. Write the minor and cofactor of each element of the following determinants and also evaluate the determinant in each case: $\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$

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4. Write mitros and cofactros of the elements of the following determinants:

$\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$

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

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5. Using Cofactors of elements of second row, evaluate $\Delta = |538201123|$

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6. Using Cofactors of elements of third column, evaluate $\Delta = |1xyz1yzx1zxy|$

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7. If $\Delta = |a_{11}a_{12}a_{13}a_{21}a_{22}a_{23}a_{31}a_{32}a_{33}|$ 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

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

Answer: D

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Ncert File Exercise 4 5

1. Find the adjoint of each of the matrices in questions 1 and 2.

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

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2. Find the adjoint of the matrices

$$\begin{bmatrix} 1 & -1 & 2 \\ 2 & 3 & 5 \\ -2 & 0 & 1 \end{bmatrix}$$

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3. Varify A (adjA)=(adjA)A=|A| I in questions 3 and 4.

$$\begin{bmatrix} 2 & 3 \\ -4 & -6 \end{bmatrix}$$

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4. Find the adjoint of the given matrix and verify in ach case that $A.\,(adjA) = (adjA).\,A = |A|.\,I.$

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

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5. Find the inverse the matrix (if it exists)given in $[2 - 243]$

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

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7. Find the inverse the matrix (if it exists)given in $[123024005]$

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8. Find the inverse the matrix (if it exists)given in $[10033052 - 1]$

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9. Find the inverse the matrix (if it exists) given in $[2134 - 10 - 721]$

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10. Find the inverse the matrix (if it exists)given in $[1-1202-33-24]$

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11. Find the inverse of each of the matrices (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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12. Let $A=[3725]$and $B=[6879]$. Verify that $(AB)^{-1}=B^{-1}A^{-1}$.

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13. If $A=[31-12]$, show that $A^2-5A+7I=O$. Hence, find A^{-1} .

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

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

$2xy + 3 \quad z = 12$

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15. For the matrix $A = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{vmatrix}$, then that $A^3 - 6A^2 + 5A + 11I = 0.$ find A^{-1}

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16. 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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17. 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. $3|A|$

Answer: B

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18. If A is an invertible matrix of order 2, then det $\left(A^{-1}\right)$ is equal to(a) det (A) (B) $\frac{1}{\det(A)}$ (C) 1 (D) 0

A. det (A)

B. $\frac{1}{\det(A)}$

C. 1

D. 0

Answer: B

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Ncert File Exercise 4 6

1. Examine the consistency of the system of equations $x + 2y = 2$

$2x + 3y = 3$

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2. Examine the consistency of the system of equations $2x - y = 5$

$x + y = 4$

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3. Examine the consistency of the system of equations$x + 2y = 2$

$2x + 3y = 3$

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4. Examine the consistency of the system of equations

$x + y + z = 1 \quad 2x + 3y + 2z = 2$

$ax + ay + 2a \quad z = 4$

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5. Examine the consistency of the system of equations$3xy2z = 22yz = 1$

$3x5y = 3$

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6. Examine the consistency of the system of equations in

$5x - y - 4z = 5$

$2x + 3y + 5z = 2$

$5x - 2y + 6z = -1$

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7. Solve system of linear equations, using matrix method, $5x + 2y = 4$

$7x + 3y = 5$

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

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

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9. Solve system of linear equations, using matrix method, $4x3y = 3$

$3x5y = 7$

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10. Solve system of linear equations, using matrix method,$5x + 2y = 4$

$7x + 3y = 5$

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11. Solve system of linear equations, using matrix method,$2x + y + z = 1$

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

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

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

$x + y + z = 2$

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

$2x + 3y + 3z = 5x - 2y + z = -43x - y2z = 3$

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14. Solve system of linear equations, using matrix method, in

$x - y + 2z = 7$
$3x + 4y - 5z = -5$
$2x - y + 3z = 12$

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15. If $A = (2 - 3532 - 411 - 2)$, find A^{-1}. Using A^{-1} solve the following system of equations:

$2x - 3y + 5z = 16;\ 3x + 2y - 4z = -4;\ x + y - 2z = -3$

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16. 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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Miscellaneous Exercise On Chapter 4

1. 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.

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2. 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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3. Ecaluate

$$\begin{bmatrix} \cos\alpha\cos\beta & \cos\alpha\sin\beta & -\sin\alpha \\ -\sin\beta & \cos\beta & 0 \\ \sin\alpha\cos\beta & \sin\alpha\sin\beta & \cos\alpha \end{bmatrix}$$

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4. 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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5. Solve the equation $|x + a \times \times + a \times \times + a| = 0, a \neq 0$

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6. Prove that $|a^2 bcac + c^2 a^2 + a \hat{} 2aca \hat{} 2 + b \hat{} 2| = 4a^2 b^2 c^2$.

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

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

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

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9. Evaluate: $\begin{bmatrix} x & y & x+y \\ y & x+y & x \\ x+y & x & y \end{bmatrix}$

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

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11. Using peoperties of determinants in questions 11 to 15, prove that :

$$\begin{vmatrix} \alpha & \alpha^2 & \beta+\gamma \\ \beta & \beta^2 & \gamma+\alpha \\ \gamma & \gamma^2 & \alpha+\beta \end{vmatrix} = (\beta-\gamma)(\gamma-\alpha)(\alpha-\beta+\gamma)$$

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12. Using properties of determinants. Prove that

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

, where p is any scalar.

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13. Using properties of determinants, prove the following:

$|3a - a + b - a + ca - b3bc - ba - cb - c3c| = 3(a + b + c)(ab + bc +$

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14. Show that

$|11 + p1 + p + q23 + 2p1 + 3p + 2q36 + 3p106p + 3q| = 1.$

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15. Show 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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16. $\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4, \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1, \frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2$

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17. Choose the correct answer in questions 17 to 19:

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

A. 0

B. 1

C. x

D. $2x$

Answer: A

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18. Choose the correct answer in questions 17 to 19:

If x, y, z are nonzero real numbers then the inverse of metrix $A = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$ 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) $\dfrac{1}{xyz}\begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$

(d) $\dfrac{1}{xyz}\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

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. $\dfrac{1}{xyz}\begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$

D. $\dfrac{1}{xyz}\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Answer: A

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19. Let $A = \begin{bmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{bmatrix}, where 0 \le \theta < 2\pi$ then (A) $|A| = 0$ (B) $|A|\varepsilon[2, 4]$ (C) $|A|\varepsilon)(0, \infty)$ (D) $|A|\varepsilon(2, \infty)$

A. $Det(A) = 0$

B. $Det(A)\varepsilon(2, \infty)$

C. $Det(A)\varepsilon(2, 4)$

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

Answer: D

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Exercise

1. $\begin{vmatrix} x & p & q \\ p & x & q \\ p & q & x \end{vmatrix} =$

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2. Show that $\begin{vmatrix} 0 & b-a & c-a \\ a-b & 0 & c-b \\ a-c & b-c & 0 \end{vmatrix} = 0$

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

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4. Show that the points $(a+5, a-4)$, $(a-2, a+3)$ and (a, a) do not lie on a straight line of any value of a.

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Revision Exercise

1. For the matrix $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$. Find 'x' and 'y' so that $A^2 + xI = yA$.

Hence find A^{-1}.

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2. $\begin{vmatrix} 1 & \cos(\beta - \alpha) & \cos(\gamma - \alpha) \\ \cos(\alpha - \beta) & 1 & \cos(\gamma - \beta) \\ \cos(\beta - \alpha) & \cos(\beta - \gamma) & 1 \end{vmatrix} =$

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3. Prove tha following

$$\begin{vmatrix} a + b + nc & na - a & nb - b \\ nc - c & b + c + na & nb - b \\ nc - c & na - a & c + a + nb \end{vmatrix} = n(a + b + c)^3.$$

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4. Prove: $\left| \frac{a^2 + b^2}{c} a \frac{b^2 + c^2}{a} a \frac{\mathbf{c^2 + a^2}}{b} \right| = 4abc$

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5. Prove that

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

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6. Show that

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

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7. Prove that $\Delta = \begin{vmatrix} 1 & bc+ad & b^2c^2+a^2d^2 \\ 1 & ca+bd & c^2a^2+b^2d^2 \\ 1 & ab+cd & a^2b^2+c^2d^2 \end{vmatrix} = (a-b)(a-c)(a-d)(b-c)(b-d)(c-d).$

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8. $\begin{vmatrix} (a+1)(a+2) & a+2 & 1 \\ (a+2)(a+3) & a+3 & 1 \\ (a+3)(a+4) & a+4 & 1 \end{vmatrix} = -2$

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9. Evaluate $\begin{vmatrix} .^x C_1 & .^x C_2 & .^x C_3 \\ .^y C_1 & .^y C_2 & .^y C_3 \\ .^x C_1 & .^z C_2 & .^z C_3 \end{vmatrix}$

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10. Prove that

$\Delta = [a + bxc + dxp + qxax + bcx + dpx + quvw] = (1 - x^2)|acpbdqucw$

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11. Ecaluate

$$\begin{bmatrix} \cos\alpha\cos\beta & \cos\alpha\sin\beta & -\sin\alpha \\ -\sin\beta & \cos\beta & 0 \\ \sin\alpha\cos\beta & \sin\alpha\sin\beta & \cos\alpha \end{bmatrix}$$

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

where a, b, c are all different, then the determinant

$\begin{vmatrix} 1 & 1 & 1 \\ (x-a)^2 & (x-b)^2 & (x-c)^2 \\ (x-b)(x-c) & (x-c)(x-a) & (x-a)(x-b) \end{vmatrix}$ vanishes when

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13. Solve for $x \in R$: $\begin{vmatrix} (x+a)(x-a) & (x+b)(x-b) & (x+c)(x-c) \\ (x-a)^3 & (x-b)^3 & (x-c)^3 \\ (x+a)^3 & (x+b)^3 & (x+c)^3 \end{vmatrix}$

=0, a,b and c being distinct real numbers.

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14. If a,b,c are in A.P. find the value of:

$$| \, | \, 2y+4, 5y+7, 8y+a], [3y+5, 6y+8, 9y+b], [4y+6, 7y+9, 10y+c$$

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15. If

$$ax^2+2hxy+by^2+2gx+2fy+c \equiv (lx+my+n)(l'x+m'y+n')$$

, then prove that :

$$\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix} = 0$$

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16. If $a+b+c=0$ and $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$ then x=

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17. 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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18. Using properties of determinants. Prove that

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

, where p is any scalar.

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19. If $A=\begin{bmatrix}3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1\end{bmatrix}$, then

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

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21. If $A = [1 \tan x - \tan x 1]$, show that $A^T A^{-1} = [\cos 2x - \sin 2x \sin 2x \cos 2x]$.

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22. If $A = \begin{bmatrix} 2 & -3 \\ 4 & 6 \end{bmatrix}$ verify that $(adjA)^{-1} = (adjA^{-1})$.

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23. Prove that :

$adj.\ I_n = I_n$

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24. Prove that :

$adj. O = O$

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25. Prove that :

$I_n^{-1} = I_n$

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26. Find the inverse of each of the matrices given below :

Let $D = \text{diag}[d_1, d_2, d_3]$ where none of d_1, d_2, d_3 is), prove that

$D^{-1} = \text{diag}\left[d_1^{-1}, d_2^{-1}, d_3^{-1}\right]$.

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27. Let $F(\alpha)=\begin{bmatrix}\cos\alpha & -\sin\alpha & 0\\ \sin\alpha & \cos\alpha & 0\\ 0 & 0 & 1\end{bmatrix}$ and $G(\beta)=\begin{bmatrix}\cos\beta & 0 & \sin\beta\\ 0 & 1 & 0\\ -\sin\beta & 0 & \cos\beta\end{bmatrix}$.

Show that $[F(\alpha).\,G(\beta)]^{-1}=G(-\beta).\,F(-\alpha)$.

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28. Find the inverse of each of the matrices given below :

Obtain the inverse of the matrics $\begin{bmatrix}1 & p & 0\\ 0 & 1 & p\\ 0 & 0 & 1\end{bmatrix}$ and $\begin{bmatrix}1 & 0 & 0\\ q & 1 & 0\\ 0 & q & 1\end{bmatrix}$. And, hence find the inverse of the matrix $\begin{bmatrix}(1+pq) & p & 0\\ q & (1+pq) & p\\ 0 & q & 1\end{bmatrix}$.

Let the first two matrices be A and B. Then, the third matrix is AB. Now, $(AB)^{-1}=\left(B^{-1}A^{-1}\right)$

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

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30. If $a \neq p, b \neq q, c \neq r and |pbcaqcabr| = 0,$ then find the value of $\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c}.$

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31. Suppose that digit numbers A28,3B9 and 62 C, where A,B and C are integers between 0 and 9 are divisible by a fixed integer k, prove that the determinant $\begin{vmatrix} A & 3 & 6 \\ 8 & 9 & C \\ 2 & B & 2 \end{vmatrix}$ is also divisible by k.

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32. let $a > 0, d > 0$ find the value of the determinant

$$\begin{vmatrix} \frac{1}{a} & \frac{1}{a(a+d)} & \frac{1}{(a+d)(a+2d)} \\ \frac{1}{a+d} & \frac{1}{(a+d)(a+2d)} & \frac{1}{(a+2d)(a+3d)} \\ \frac{1}{a+2d} & \frac{1}{(a+2d)(a+3d)} & \frac{1}{(a+3d)(a+4d)} \end{vmatrix}$$

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Check Your Understanding

1. Evalute the determinants in queations 1 and 2 :

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

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2. If $\begin{vmatrix} x & 2 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 9 & 6 \end{vmatrix}$, then the value of 'x' is ....

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3. Answer in one word

$\begin{vmatrix} 3 & 1 & 9 \\ 5 & 2 & 15 \\ 7 & 4 & 21 \end{vmatrix}$.

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4. If any two rows (or columns) of a determinant are identical, then the value of the determinant is zero.

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5. Is $\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}-1\right)$ a factor of $\begin{vmatrix}1+a & 1 & 1\\ 1 & 1+b & 1\\ 1 & 1 & 1+c\end{vmatrix}$?

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6. If A is an invertible square matrix of order 4, then $|adjA| =$ ....

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7. If A is square matrix of order n then $adj(adjA =$ (1) $|A|^{n-1}A$ (2) $|A|^{n-2}A$ (3) $|A|^{n-2}$ (4) $|A|^{n}A$

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8. Find the inverse of $A = \begin{bmatrix} 2 & -6 \\ 1 & -2 \end{bmatrix}$.

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9. If A is a square matrix satisfying $A^2 = 1$, then what is the inverse of A ?

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10. Is the matrix $\begin{bmatrix} \pi & 22 \\ \frac{1}{7} & 1 \end{bmatrix}$ singular?

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Competition File

1. Let a,b and c be such that (b+c) $\neq$ 0 . If

$$\begin{vmatrix} a & a+1 & a-1 \\ -b & b+1 & b-1 \\ c & c-1 & c+1 \end{vmatrix} + \begin{vmatrix} a+1 & b+1 & c-1 \\ a-1 & b-1 & c+1 \\ (-1)^{n+2}a & (-1)^{n+1}b & (-1)^{n}c \end{vmatrix} = 0$$, then

the value of 'n' is :

A. zero

B. any integer

C. any odd integer

D. any integer

Answer: C

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2. The number of values of k for which the linear equations $4x + ky + 2z = 0$ $kx + 4y + z = 0$ $2x + 2y + z = 0$ posses a non-zero solution is : (1) 3 (2) 2 (3) 1 (4) zero

A. 3

B. 2

C. 1

D. zero

Answer: B

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3. The number of values of k, for which the system of eauations:

$(k+1)x+8y=4k$

$kx+(k+3)y=3k-1$

has no solution is,

A. 1

B. 2

C. 3

D. infinite.

Answer: A

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4. If $P = \begin{bmatrix} 1 & \alpha & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 4 \end{bmatrix}$ is the adjoint of 3×3 matrix A and $|A| = 4$, then $\alpha =$

A. 11

B. 5

C. 0

D. 4

Answer: A

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5. If $\alpha, \beta \neq 0$, and $f(n) = \alpha^n + \beta^n$ and $|31 + f(1)1 + f(2)1 + f(1)1 + f(2)1 + f(3)1 + f(2)1 + f(3)1 + f(4)| =$, then K is equal to (1) $\alpha\beta$ (2) $\frac{1}{\alpha\beta}$ (3) 1 (4) -1

A. $\frac{1}{\alpha\beta}$

B. 1

C. -1

D. $\alpha\beta$

Answer: B

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6. The set of all values of λ for which the system of linear equations : $2x_1 - 2x_2 + x_3 = \lambda x_1$ $2x_1 - 3x_2 + 2x_3 = \lambda x_2$ $-x_1 + 2x_2 = \lambda x_3$ has a non-trivial solution, (1) is an empty set (2) is a singleton (3) contains two elements (4) contains more than two elements

A. is an empty set

B. is a singleton

C. contains 2 elements

D. contains more than 2 elements

Answer: C

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7. The system of linear equations $x + \lambda y - z = 0$ $\lambda x - y - z = 0$ $x + y - \lambda z = 0$ has a non-trivial solution for : (1) infinitely many values of λ . (2) exactly one value of λ . (3) exactly two values of λ . (4) exactly three values of λ .

A. Eaxctly one value of λ

B. Eaxctly two value of λ

C. Eaxctly three value of λ

D. Infinitely many values of λ.

Answer: C

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8. Let ω be a complex number such that $2\omega + 1 = z$ where $z = \sqrt{-3}$. If $|(1, 1, 1), (1, -\omega^2 - 1, \omega^2), (1, \omega^2, \omega^7)| = 3k$, then k is equal to

A. -1

B. 1

C. $-z$

D. z

Answer: C

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9. If S is the set of distinct values of $'b$ for which the following system of linear equations $x + y + z = 1\, x + ay + z = 1\, ax + by + z = 0$ has no solution, then S is : a finite set containing two or more elements (2) a singleton an empty set (4) an infinite set

A. a finite set containing two or more elements

B. a singleton

C. an empty set

D. an infinite set

Answer: B

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10. If $A = \begin{vmatrix} 2 & -3 \\ -4 & 1 \end{vmatrix}$ then adj $(3A^2 + 12A)$ is equal to

A. $\begin{bmatrix} 51 & 84 \\ 63 & 72 \end{bmatrix}$

B. $\begin{bmatrix} 72 & -63 \\ -84 & 51 \end{bmatrix}$

C. $\begin{bmatrix} 72 & -84 \\ -63 & 51 \end{bmatrix}$

D. $\begin{bmatrix} 51 & 63 \\ 84 & 72 \end{bmatrix}$

Answer: D

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11. If $\begin{vmatrix} x-4 & 2x & 2x \\ 2x & x-4 & 2x \\ 2x & 2x & x-4 \end{vmatrix} = (A+Bx)(x-A)^2$ then the ordered pair (A,B) is equal to

A. $(-4, -5)$

B. $(-4, 3)$

C. $(-4, 5)$

D. $(4, 5)$

Answer: C

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12. If the system of linear equations x+ky+3z=0 3x+ky-2z=0 2x+4y-3z=0 has a non-zero solution (x,y,z) then $\frac{xz}{y^2}$ is equal to

A. -10

B. 10

C. -30

D. 30

Answer: B

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13. An ordered pair (α, β) for which the system of linear equations

$(1+\alpha)x + \beta y + z = 2$

$\alpha x + (1+\beta)y + z = 3$

$\alpha x + \beta y + 2z = 2$

has a unique solution, is

A. $(1, -3)$

B. $(2, 4)$

C. $(-3, 1)$

D. $(-4, 2)$

Answer: B

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14. If α, β are the roots of $x^2 + x + 1 = 0$ then

$$\begin{vmatrix} Y + 1 & \beta & \alpha \\ \beta & y + \alpha & 1 \\ \alpha & 1 & y + \beta \end{vmatrix}$$

A. $y^2 - 1$

B. $y(y^2 - 1)$

C. $y^2 - y$

D. y^3

Answer: D

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Chapter Test 4

1. If $\Delta = |a_{11}a_{12}a_{13}a_{21}a_{22}a_{23}a_{31}a_{32}a_{33}|$ 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

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

B. $a_{11}A_{11} + a_{12} + A_{21} + a_{13}A_{33}$

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

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

Answer: B

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2. Let $A = \begin{bmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{bmatrix}, where 0 \leq \theta < 2\pi$ then (A) $|A| = 0$ (B) $|A| \varepsilon [2, 4]$ (C) $|A| \varepsilon)(0, \infty)$ (D) $|A| \varepsilon (2, \infty)$

A. Det $(A) = 0$

B. Det $(A)\varepsilon(2, \infty)$

C. Det $(A)\varepsilon(2, 4)$

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

Answer: D

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3. If A is a square matrix of order 3 and $|3A| = k|A|$ then find the value of k,

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4. If $| \times 1x| = |3412|,$ write the positive value of x.

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5. If A is a square matrix of order 3 such that |adj A|=225 find |A'|

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6. Using properties of determinants, prove that following: $|\mathrm{a + b + 2cabcb + c + 2abcac + a + 2b}| = 2(\mathrm{a + b + c})^3$

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7. Prove that

$$\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & bc & c^2+1 \end{vmatrix} = 1 + a^2 + b^2 + c^2.$$

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8. Using Cofactors of elements of third column, evaluate $\Delta = |1xyz1yzx1zxy|$

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9. Find the values of k if area of triangle is 4 sq. units and vertices are: (-2,0),(0,4)(0,k)`

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10. Find the inverse of the $matrixA = \left[(1, b), \left(c, \frac{1+bc}{a}\right]$ and show that $aA^{-1} = \left(a^2 + bc + 1\right)I - aA$

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11. Using properties of determinants, prove that $|aa + ba + b + c2a3a + 2b4a + 3b + 2c3a6a + 3b10a + 6b + 3c| = a^3$

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12. If $A = (2 - 3532 - 411 - 2)$, find A^{-1}. Using A^{-1} solve the following system of equations: $2x - 3y + 5z = 16;\ \ 3x + 2y - 4z = -4;\ \ x + y - 2z = -3$

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