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MATHS

BOOKS - USHA MATHS (ODIA ENGLISH)

MATRICES DETERMINANTS PROBABILITY

Exercise

1. Write the value of the following determinant:

$$\begin{vmatrix} 0 & 0 & 3 \\ 0 & 3 & 0 \\ 3 & 0 & 0 \end{vmatrix}$$

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2. If every element of a third order determinant having value 8 is divided by 2, then what is the value of the resulting determinant?

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3. If the co-factor and minor of each element of a 2nd order determinant are same, then what is the value of the element in the 2nd row and 1st column of the determinant ?

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4. If each element of a determinant of 3rd order is multiplied by k, then how many times the value of the determinant will be multiplied?

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5. Find the value of $\begin{vmatrix} \cos^2\alpha & \sin^2\alpha+1 & 1 \\ \cos^2\beta & \sin^2\beta+1 & 1 \\ \cos^2\gamma & \sin^2\gamma+1 & 1 \end{vmatrix}$

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6. If $\begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix} = 0$, then find the value (s) of x.

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7. Write the relation between x and y if the points (a, 0), (0, b) and (x, y) are collinear.

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8. Answer the following:

What is the value of x if

$$\begin{bmatrix} x+1 & 1 & 1 \\ 1 & 1 & -1 \\ -1 & 1 & 1 \end{bmatrix} = 4 ?$$

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9. Find x and y if $|[x, y], [1, 1]| = 2$. $|[x, 3], [y, 2]| = 1$.

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10. Answer the following:

What is the value of x if

$$\begin{bmatrix} 4 & 1 \\ 2 & 1 \end{bmatrix}^2 = \begin{bmatrix} 3 & 2 \\ 1 & x \end{bmatrix} - \begin{bmatrix} x & 3 \\ -2 & 1 \end{bmatrix} ?$$

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11. Find x,y if $\begin{bmatrix} 3 & 2 \\ 7 & x \end{bmatrix} \begin{bmatrix} 5 & -2 \\ -7 & y \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.

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12. Rectify the mistake : Matrix multiplication is commutative and associative,

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13. If $A = [xyz], B = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$, find AB and its order.

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14. If matrix A is of order 3×4 and matrix B is of order 4×3, what is the number of elements in AB?

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15. If Ais a square matrix and $|A| = 10$, then find $\left|A^{-1}\right|$

.

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16. If $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$, find $|adjA||A|$.

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17. If A is a square matrix given by $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, find adj (adj A).

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18. What is the value of $\begin{vmatrix} \sin^2\theta & \cos^2\theta & 1 \\ \cos^2\theta & \sin^2\theta & 1 \\ -10 & 12 & 2 \end{vmatrix}$?

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19. If A is a 2×2 non-singular matrix and $|A| = \frac{1}{2}$ then which matrix is represented by $A \times adjA$?

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20. What is the order of the matrix B if $\begin{bmatrix} 3 & 4 & 2 \end{bmatrix} B = \begin{bmatrix} 2 & 1 & 0 & 3 & 6 \end{bmatrix}$

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21. State'True'or'false':For any square matrix A, AA' is symmetric.

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22. State 'True' or 'False'. For any square matrix A, $A + A'$ is symmetric.

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23. State 'True' or 'False'. For any square matrix A, $A - A'$ is skew symmetric.

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24. If A is a 4×5 matrix and B is a matrix such that $A^T B$ and BA^T both are defined, then write the order of B.

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25. If A and B are two square matrices of same order, then $(A+B)^2 = A^2 + 2AB + B^2$ can hold if and only if

A. $AB = BA$

B. $AB + BA = O$

C. $|AB| \neq 0$

D. $|AB| = 0$

Answer:

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26. 1.Solve for x: $\begin{vmatrix} 1 & 1 & x \\ p+1 & p+1 & p+x \\ 3 & x+1 & x+2 \end{vmatrix} = 0$

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27. Solve $\begin{bmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{bmatrix} = 0$

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28. If A+B+C = π, prove that

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

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29. Without expanding,show that the following determinant vanishes. $\begin{vmatrix} 2x & x+y & x+z \\ y+x & 2y & y+z \\ z+x & z+y & 2z \end{vmatrix}$

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30. Without expanding,show that the following determinant vanishes. $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix}$

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31. Without expanding,show that the following determinant vanishes. $\begin{vmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{vmatrix}$

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32. Without expanding,show that the following determinant vanishes. $\begin{vmatrix} 6 & 2 & 1 \\ 9 & 3 & 2 \\ 12 & 4 & 3 \end{vmatrix}$

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33. Show 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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34. If a, b and c are all positive real, then prove that minimum value of determinant

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

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35. Show that:

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

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36. Prove that:

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

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37. Solve by cramer's rule :$2x + 3y = 6, 4x + 6y = 12$

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38. If A=$\begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$,show that $A^2 - 5A - 14I = O$, where I is a unit matrix of Oder 2.

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39. Find the matrix B,if $B^2 = \begin{bmatrix} 16 & 0 \\ 0 & 16 \end{bmatrix}$.

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40. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} -2 & 3 \\ -1 & 2 \end{bmatrix}$,show that $(A+B)^T = A^T + B^T$.

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41. If $A = \begin{bmatrix} 2 & 0 & 3 \\ 3 & 4 & 5 \end{bmatrix}, B = \begin{bmatrix} 3 & -1 & 2 \\ 0 & 2 & 3 \end{bmatrix}$ and $c = \begin{bmatrix} 2 & -3 & 0 \\ 1 & 4 & 5 \end{bmatrix}$ find $(A+B-C)^T$

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42. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} -2 & 3 \\ -1 & 2 \end{bmatrix}$,show that $(A+B)^T = A^T + B^T$.

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43. If $A = \begin{bmatrix} 2 & 0 & 3 \\ 3 & 4 & 5 \end{bmatrix}, B = \begin{bmatrix} 3 & -1 & 2 \\ 0 & 2 & 3 \end{bmatrix}$ and $c = \begin{bmatrix} 2 & -3 & 0 \\ 1 & 4 & 5 \end{bmatrix}$ find $A^T - B^T$

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44. Find the matrix A if $A^2 = \begin{bmatrix} 17 & 8 \\ 8 & 17 \end{bmatrix}$.

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45. Verify that $(AB)^{-1} = B^{-1}A^{-1}$ if $A = \begin{bmatrix} 2 & 3 \\ 1 & -1 \end{bmatrix}, B = \begin{bmatrix} 0 & 1 \\ 3 & 1 \end{bmatrix}$

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46. Verify that $(AB)^{-1} = B^{-1}A^{-1}$ if $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 & 0 \\ 2 & 3 & -1 \\ 1 & -1 & 3 \end{bmatrix}$

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

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48. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ then prove that $A^2 - 5A + 7I = O$

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49. Show that the matrix $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ satisfies the equation $A^2 - 4A + I = O$ where I is a 2×2 identity matrix and O is 2×2 zero matrix.Using this equation.find A^{-1}.

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50. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then prove that $A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}, n \in N.$

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51. Express the matrix $A = \begin{bmatrix} 4 & 2 & -3 \\ 1 & 3 & -6 \\ -5 & 0 & -7 \end{bmatrix}$ as the sum of symmetric and skew symmetric matrix.

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52. Examining consistency and solvability, solve the following equation by matrix method.

2x-y+z=4

x+3y+2z=12

3x+2y+3z=16

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53. Factorise the determinant $\begin{vmatrix} x^3 - a^3 & x^2 & x \\ b^2 - a^3 & b^2 & b \\ c^3 - a^3 & c^2 & c \end{vmatrix}$ without expanding.

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54. Prove the following:

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

$$=(a^2+b^2+c^2)(a+b+c)(b-c)(c-a)(a-b)$$

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55. Show 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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56. If $D = \begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix}$ and $D' = \begin{vmatrix} b+c & c+a & a+b \\ a+b & b+c & c+a \\ c+a & a+b & b+c \end{vmatrix}$ prove that D'=2D

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

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58. Show 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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59. Prove that the following.

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

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