MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

DETERMINANT

One Marks Questions With Answers

1. Evaluate the following determinants:

(a) $\begin{vmatrix} 2 & 4 \\ -5 & -1 \end{vmatrix}$

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2. Evaluate the following determinants:

(b)

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

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

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4. If $A = [(1, 0, 1), (0, 1, 2), (0, 04)]$, then show that $|3A| = 27|A|$.

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

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

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7. Find the value of x if, $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$

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8. Find the values of x for which $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$

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9. Find the adjoint of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

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

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

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12. If A is a square matrix with |A| = 6, find the value of $|AA'|$.

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13. Evaluate: $\begin{vmatrix} 2 & 4 & 5 \\ 5 & 7 & 3 \\ 2 & 4 & 5 \end{vmatrix}$

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14. If A is square matrix of order 3 and $|A| = 5$ then find $|AdjA|$.

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15. Define a singular matrix.

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16. If A is an invertible matrix of order 2×3 such that $|A| = 5$ then find $\left|A^{-1}\right|$.

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17. If A is a square matrix A. $(AdjA) = 10I$ then find $|AdjA|$.

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18. If $A = \begin{bmatrix} 2 & 3 \\ 6 & x \end{bmatrix}$ is singular then find x.

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19. If $A = \begin{bmatrix} 2 & 3 \\ 5 & 8 \end{bmatrix}$ find $|AdjA|$.

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20. Find the adjoint of $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

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21. If $A = \begin{bmatrix} 7 & 3 \\ 5 & 2 \end{bmatrix}$ find A^{-1}.

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Two Marks Questions With Answers

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

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

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2. Find area of the triangle with vertices (2,7),(1,1),(10,8).

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3. Using determinants show that points A(a, b + c), B(b, c + a) and C(c, a + b) are collinear.

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

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

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5. find the equation of line joining (1,2) and (3,6) using determinants

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6. If the area of the triangle with vertices (2,-6),(5,4) and (K,4) is 35 sq. units, then find the values of K, using determinants.

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7. If each element of a row is expressed as sum of two elements then verify for a third order determinant that the determinant can be expressed as sum of two determinants.

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8. Find the inverse of the matrix $A = \begin{bmatrix} 2 & -2 \\ 4 & 3 \end{bmatrix}$

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9. Examine the consistency of the system of equations given by $x + 2y = 2, 2x + 3y = 3$

Note: the system of equations of the form AX = B is consistent, if $|A| \neq 0$. If $|A| = 0$ and (adjoint of A)(B) = 0 then the system of equations is consistent and if (Adjoint of A) $(B) \neq 0$. Then the system of equation is inconsistent.

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10. Prove that the value of the determine remains unchanged if its rows and columns are interchanged.

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11. If any two rows (or columns) of a determinant are interchanged then the sign of a determinant changes.

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12. Prove that if each element of a row (or a column) of a determinant is multiplied by k, then its value gets multiplied by k.

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13. Prove that if to each element of any row or column of a determinant, the equimultiples of corresponding elements of other row (or column) are added, then value of determinant remains the same.

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Four Marks Questions With Answers

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

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

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

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

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

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7. Prove that

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

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8. Prove that $\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = \left(1 - x^3\right)^2.$

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

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

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

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

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13. $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} = 0$

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

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15. Evaluate $\Delta - \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$

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

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

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

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

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

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21. Show that $\begin{vmatrix} x & p & q \\ p & x & x \\ q & q & x \end{vmatrix} = (x-p)\left(x^2+px-2q^2\right)$

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Five Marks Questions With Answers

1. Solve the following system of linear equations by matrix method.

3x-2y+3z=8

2x+y-z=1

4x-3y+2z=4

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2. If $A = \begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$, find A^{-1}. Using A^{-1} solve the system of equations.

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

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3. Solve the following equations by matrix method.

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

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4. Solve the following equations by matrix method.

If $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ verify that $A^3 - 6A^2 + 9A = 4I = 0$ and hence, find A^{-1}.

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5. Solve the following equations by matrix method.

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

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6. 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 number, we get double of the second number. Represent it algebraically and find the numbers using matrix method.

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7. The cost of 4kg onion, 3 kg wheat and 2kg rise in Rs. 40. The cost of 2kg onion, 4 kg wheat and 6 kg rice in Rs.90. The cost of 6kg onion, 2kg wheat and 3 kg rice is Rs.70. Find cost of each item per kg by matrix method.

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8. Use the 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 system of equations

$x - y + 2z = 1$

$2y - 3z = 1$

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

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9. Prove that $\begin{vmatrix} a+bx & c+dx & p+qx \\ ax+b & cx+d & px+q \\ u & v & w \end{vmatrix} = (1-x^3)\begin{vmatrix} a & c & p \\ b & d & q \\ u & v & w \end{vmatrix}$

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Try Yourself

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

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2. Prove that the value of the determine remains unchanged if its rows and columns are interchanged.

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3. If any two rows (or columns) of a determinant are interchanged then the sign of a determinant changes.

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4. If any two rows (or columns) of a determinant are identical then the value of the determinants is 0.

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5. If each element of a row (or a column) of a determinant is multiplied by a constant k then its value gets multiplied by k.

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6. Prove that $\begin{vmatrix} x & y & y \\ y & x & y \\ y & y & x \end{vmatrix} = (x+2y)(x-y)^2$

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7. Prove that $\begin{vmatrix} x & p & q \\ p & x & q \\ p & q & x \end{vmatrix} = (x-p)(x-q)(x+p+q)$

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

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

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10. Prove that $(AB)^{-1} = B^{-1}.A^{-1}$ give that $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$.

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