MATHS

BOOKS - NCERT MATHS (ENGLISH)

DETERMINANTS

Short Answer Type Questions

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

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2. evaluate: $\begin{vmatrix} a + x & y & z \\ x & a + y & z \\ x & y & a + z \end{vmatrix}$

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3. evaluate: $\begin{vmatrix} 0 & xy^2 & xz^2 \\ x^2y & 0 & yz^2 \\ x^2z & zy^2 & 0 \end{vmatrix}$

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4. evaluate: $\begin{vmatrix} 3x & -x+y & -x+z \\ x-y & 3y & z-y \\ x-z & y-z & 3z \end{vmatrix}$

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5. evaluate: $\begin{vmatrix} x+4 & x & x \\ x & x+4 & x \\ x & x & x+4 \end{vmatrix}$

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6. evaluate: $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$

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7. prove that: $\begin{vmatrix} y^2z^2 & yz & y+z \\ z^2x^2 & zx & z+x \\ x^2y^2 & xy & x+y \end{vmatrix} = 0$

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8. prove that: $\begin{vmatrix} y+z & z & y \\ z & z+x & x \\ y & x & x+y \end{vmatrix} = 4xyz$

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9. Using properties of determinants, prove that 3 2 (a 1) 3 3 1 2a 1 a 2 1 a 2a 2a

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10. If A+B+C=0, then prove that $Det\begin{bmatrix} 1 & \cos C & \cos B \\ \cos C & 1 & \cos A \\ \cos B & \cos A & 1 \end{bmatrix} = 0$

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11. If the coordinates of the vertices of an equilateral triangle with sides of length a are $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3) then $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}^2 = \frac{3a^4}{4}$

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12. Find the value of θ if $\begin{vmatrix} 1 & 1 & \sin 3\theta \\ -4 & 3 & \cos 2\theta \\ 7 & -7 & -2 \end{vmatrix} = 0$

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13. If $\begin{vmatrix} 4-x & 4+x & 4+x \\ 4+x & 4-x & 4+x \\ 4+x & 4+x & 4-x \end{vmatrix} = 0$ find the value of x.

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14. If $a_1, a_2, a_3, \ldots, a_r$ are in GP, then prove that the determinant $\begin{vmatrix} a_{r+1} & a_{r+5} & a_{r+9} \\ a_{r+7} & a_{r+11} & a_{4+15} \\ a_{r+11} & a_{r+17} & a_{r+21} \end{vmatrix}$ is independent of r.

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15. 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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16. Show that ΔABC is an isosceles triangle, if the determinant

$$\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1+\cos A & 1+\cos B & 1+\cos C \\ \cos^2 A+\cos A & \cos^2 B+\cos B & \cos^2 C+\cos C \end{vmatrix} = 0\,.$$

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17. 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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Long Answer Type Questions

1. If $A = [120 - 2 - 1 - 20 - 11]$, find A^{-1}. Using A^{-1}, solve the system of linear equations

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

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2. Using matrix method, solve the system of equation $3x + 2y - 2z = 3$, $x + 2y + 3z = 6$ and $2x - y + z = 2$

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3. If $A = \begin{vmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{vmatrix}$ and $B = \begin{vmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{vmatrix}$ then find BA and use ths to sovle the system of equations

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

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4. If $a + b + c \neq$ and $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = 0$ then prove that $a = b = c$

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5. Prove that:

$$\left|bc - a^2ca - b^2ab - c^2ca - b^2ab - c^2bc - a^2ab - c^2bc - a^2ca - b^2\right|$$

is divisible by $a + b + c$ and find the quotient.

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6. If $x+y+z=0$ prove that $|xaybzcyczaxbzbxcyay| = xyz|abccabbca|$

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Objective Type Questions

1. 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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2. The value of $\begin{vmatrix} a-b & b+c & a \\ b-a & c+a & b \\ c-a & a+b & c \end{vmatrix}$ is

A. $a^3+b^3+c^3$

B. $3bc$

C. $a^3+b^3+c^3-3abc$

D. None of these

Answer: D

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3. 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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4. The determinat $\Delta = \begin{vmatrix} b^2-ab & b-c & bc-ac \\ ab-a^2 & a-b & b^2-ab \\ bc-ac & c-a & ab-a^2 \end{vmatrix}$ equals

A. $abc(b-c)(c-a)(a-b)$

B. $(b-c)(c-a)(a-b)$

C. $(a+b+c)(b-c)(c-a)(a-b)$

D. None of these

Answer: D

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5. The number of distinct real roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ in the interval $-\frac{\pi}{4} \leq x \leq \frac{\pi}{4}$ is

A. 0

B. 2

C. 1

D. 3

Answer: C

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6. 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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7. Let $f(t) = \begin{vmatrix} \cos t & t & 1 \\ 2\sin t & t & 2t \\ \sin t & t & t \end{vmatrix}$ then find $\lim_{t \to 0} \frac{f(t)}{t^2}$.

A. 0

B. -1

C. 2

D. 3

Answer: A

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

A. $\frac{1}{2}$

B. $\frac{\sqrt{3}}{2}$

C. $\sqrt{2}$

D. $\frac{2\sqrt{3}}{4}$

Answer: A

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9. [28.If f(x)=|[0,x-a,x-bx+a,0,x-cx+b,x+c,0]| then,[1) f(a)=0, 2) f(b)=0]]

A. $f(a) = 0$

B. $f(b) = 0$

C. $f(0) = 0$

D. $f(1) = 0$

Answer: C

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10. If $A = \begin{bmatrix} 2 & a & -3 \\ 0 & 2 & 5 \\ 1 & 1 & 3 \end{bmatrix}$ then,find the value of a for which A^{-1} exists.

A. $a = 2$

B. $a \neq 2$

C. $a \neq -2$

D. none of these

Answer: D

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11. If A and B are invertible matrices then which of the following is not correct?

A. $adjA = |A|.A^{-1}$

B. $\det(A)^{-1} = [\det(A)]^{-1}$

C. $(AB)^{-1} = B^{-1}A^{-1}$

D. $(A+B)^{-1} = B^{-1} + A^{-1}$

Answer: D

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12. If x, y, z are different from zero and $\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix} = 0$ then the value of $x^{-1} + y^{-1} + z^{-1}$ is (a)xyz (b) $x^{-1}y^{-1}z^{-1}$ (c) $-x-y-z$ (d) -1

A. xyz

B. $x^{-1}y^{-1}z^{-1}$

C. $-x-y-z$

D. -1

Answer: D

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13. Using properties of determinants, prove the following:

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

A. $9x^2(x + y)$

B. $9y^2(x + y)$

C. $3y^2(x + y)$

D. $7x^2(x + y)$

Answer: B

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14. If there are two values of a which makes determinant,

$$\Delta = \begin{vmatrix} 1 & -2 & 5 \\ 2 & a & -1 \\ 0 & 4 & 2a \end{vmatrix} = 86$$ then the sum of these number is

A. 4

B. 5

C. -4

D. 9

Answer: C

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Fillers

1. If A is a matrix of order 3×3, then $|3A|$ is equal to.....

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2. If A is invertible matrix of order 3×3, then $\left|A^{-1}\right|$ is equal to.....

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3. If $x, y, z \varepsilon R$ then the value of $\begin{vmatrix} \left(2x^x + 2^{-x}\right)^2 & \left(2^x - 2^{-x}\right)^2 & 1 \\ \left(3x^x + 3^{-x}\right)^2 & \left(3^x - 3^{-x}\right)^2 & 1 \\ \left(4^x + 4^{-x}\right)^2 & \left(4^x - 4^{-x}\right)^2 & 1 \end{vmatrix}$ is

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4. If $\cos 2\theta = 0$, then $\begin{vmatrix} 0 & \cos\theta & \sin\theta \\ \cos\theta & \sin\theta & 0 \\ \sin\theta & 0 & \cos\theta \end{vmatrix}^2$ is equal to.....

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

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6. If A is a matrix of order 3×3 then the number of minors in determinant of A are.....

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7. The sum of products of elements of any row with the cofactors of corresponging elements is equal to.....

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8. If $x = -9$ is a root of $\begin{vmatrix} x & 3 & 7 \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$ then other two roots are.....

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9. $\begin{vmatrix} 0 & xyz & x-z \\ y-x & 0 & y-z \\ z-x & z-y & 0 \end{vmatrix}$ is equal to.....

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10. If $f(x) = \begin{vmatrix} (1+x)^{17} & (a+x)^{19} & (1+x)^{23} \\ (a+x)^{23} & (a+x)^{29} & (1+x)^{34} \\ (1+x)^{41} & (1+x)^{43} & (1+x)^{47} \end{vmatrix}$

$= A + Bx + Cx^2 + \ldots\ldots\ldots$ then A is equal to.....

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True False

1. $\left(A^3\right)^{-1} = \left(A^{-1}\right)^3$, where A is a square matrix and $|A| \neq 0$

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2. $(aA)^{-1} = \frac{1}{a}A^{-1}$ where a is any real number and A is a square matrix.

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3. $\left|A^{-1}\right| \neq |A+^{-1}$, where A is a non singular matrix.

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4. If A and B are matrices of order 3 and $|A| = 5, |B| = 3$, the $|3AB|$

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5. If the value of a third order determinant is 12, then find the value of the determinant formed by replacing each element by its co-factor

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6. If a,b,c are in AP show that $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} = 0$

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7. $|adjA| = |A|^2$ where A is a square matrix of order two.

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8. Using properties of determinant. Prove that

$$\begin{vmatrix} \sin A & \cos A & \sin A + \cos B \\ \sin B & \cos A & \sin B + \cos B \\ \sin C & \cos A & \sin C + \cos B \end{vmatrix} = 0$$

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9. If the determinant $\begin{vmatrix} x+a & p+u & l+f \\ y+b & q+v & m+g \\ z+c & r+w & n+h \end{vmatrix}$ splits into exactly k determinants of order 3, each element of which contains onlyone term, then the value of k is 8.

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10. If $\Delta = \begin{vmatrix} a & p & x \\ b & q & y \\ c & r & z \end{vmatrix} = 16$ then $\Delta_1 = \begin{vmatrix} p+x & a+x & a+p \\ q+y & b+y & b+q \\ r+z & c+z & c+r \end{vmatrix} = 32$

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11. The maximum value of $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1 & 1 & 1+\cos\theta \end{vmatrix}$ is $\frac{1}{2}$ Is it true or false

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