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Class: XII
Subject: Maths
Topic: Determinants
No. of Questions: 29

Q1. The value of the determinant $\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$ is equal to

1. 6 xyz
2. xyz
3. 4 xyz
4. xy + yz + zx

Q2. If 5 is one of the roots of equation $\begin{vmatrix} x & 3 & 7 \\ 2 & x & -2 \\ 7 & 8 & x \end{vmatrix} = 0$, then other two roots of equation are

1. 2, 7
2. 2, – 7
3. 2, 7
4. 2, – 7

Q3. If $\begin{vmatrix} -a & 1 & 1 \\ 1 & -b & 1 \\ 1 & 1 & -c \end{vmatrix} = 0$, then the value of $\frac{1}{1+a} + \frac{1}{1+b} + \frac{1}{1+c}$ is

1. 3
2. 2
3. 1
4. 0

Q4. The eigen values of the matrix A = $\begin{bmatrix} 2 & 0 & 0 & 0 \\ 1 & 4 & 0 & 1 \\ 3 & 1 & 5 & 2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ are

1. 3, 2, 3, 4
2. 4, 5, 1, 0
3. 0, 3, 4, 5
4. 1, 2, 4, 5

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Q5. The value of $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$ is

1. 8
2. -8
3. 400
4. 0

Q6. $\begin{vmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{vmatrix}$ is equal to

1. $\frac{1}{abc}(ab + bc + ca)$
2. ab + bc + ca
3. 0
4. a + b + c

Q7. If x, y, z are non-zero real numbers, then the inverse of matrix A = $\begin{vmatrix} x & y \\ z & 1 \end{vmatrix}$ is

1. $\begin{vmatrix} 1 & -y \\ -z & x \end{vmatrix}$
2. $\frac{1}{x - yz} \times \begin{vmatrix} 1 & -y \\ -z & x \end{vmatrix}$
3. $\begin{vmatrix} 1 & -y \\ -z & -x \end{vmatrix}$
4. none of these

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Q8. If T_p, T_q, T_r are p^{th}, q^{th} and r^{th} terms of an A.P, then $\begin{vmatrix} T_p & T_q & T_r \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$ is equal to

1. 1
2. −1
3. 0
4. p + q + r

Q9. If A and B be two matrices such that A + B and AB are both defined, then

1. A and B are two matrices not necessarily of same order
2. A and B are square matrices of same order
3. Different eigen values but the same eigen vectors
4. Number of columns of A = number of rows of B

Q10. If a ≠ p, b ≠ q, c ≠ r and $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$, then the value of $\frac{p}{(p-a)} + \frac{q}{(q-b)} + \frac{r}{(r-c)}$ is

1. 12
2. 4
3. 2
4. 0

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Q11. The value of the determinant $\Delta = \begin{vmatrix} a^2 & a & 1 \\ \cos(nx) & \cos(n+1)x & \cos(n+2)x \\ \sin nx & \sin(n+1)x & \sin(n+2)x \end{vmatrix}$ is independent of

1. n
2. a
3. x
4. None of these

Q12. The roots of the equation $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 4 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0$ are

1. 1, – 2
2. -14/5, 2
3. 1, – 2
4. 1, 2

Q13. The value of $\begin{vmatrix} 0 & c & b \\ c & 0 & a \\ b & a & 0 \end{vmatrix}^2$

1. 2abc
2. $2a^2b^2c^2$
3. $a^2b^2c^2$
4. $4a^2b^2c^2$

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Q14. The value of determinant $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & b+a \end{vmatrix}$ is

1. abc
2. 4abc
3. $a^2b^2c^2$
4. 0

Q15. If $\begin{vmatrix} x & 2 & 3 \\ 4 & x & 1 \\ x & 2 & 5 \end{vmatrix}$ = 0, then x is

1. $\pm 2\sqrt{2}$
2. $\pm 3\sqrt{2}$
3. ± 3
4. $\pm 2\sqrt{3}$

Q16. The determinant $\begin{vmatrix} 1 & 1+i & i \\ 1+i & i & 1 \\ i & 1 & 1+i \end{vmatrix}$ equals

1. 7 + 4i
2. 2 – 2i
3. –7 – 4i
4. –2 + 2i

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Q17. If $\begin{vmatrix} x & 3 & 6 \\ 3 & 6 & x \\ 6 & x & 3 \end{vmatrix} = \begin{vmatrix} 2 & x & 7 \\ x & 7 & 2 \\ 7 & 2 & x \end{vmatrix} = \begin{vmatrix} 4 & 5 & x \\ 5 & x & 4 \\ x & 4 & x \end{vmatrix} = 0$, then x is equal to

1. 9
2. -9
3. 0
4. -1

Q18. Value of determinant $\begin{vmatrix} 1/a & 1 & bc \\ 1/b & 1 & ca \\ 1/c & 1 & ab \end{vmatrix}$ is

1. abc
2. 0
3. -1
4. $a^2 + bc$

Q19. If α, β, γ are the roots of $x^3 + ax^2 + b = 0$, then the determinant $\Delta = \begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}$ equals

1. $-a^3$
2. $a^3 - 3b$
3. $a^2 - 3b$
4. a^3

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Q20. The determinant $\Delta = \begin{vmatrix} \lambda a & \lambda^2 + a^2 & 1 \\ \lambda b & \lambda^2 + b^2 & 1 \\ \lambda c & \lambda^2 + c^2 & 1 \end{vmatrix}$ equals

1. λ (a – b) (b – c) (c – a)
2. λ $(a^2 + b^2 + c^2)$
3. λ (a + b + c)
4. λ^2 (a – b) (b – c) (c – a)

Q21. Find the minor of the element of second row and third column in the following determinant $\begin{bmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{bmatrix}$. [Delhi 2010]

Q22. Evaluate $\begin{vmatrix} a+ib & c+id \\ -c+id & a-ib \end{vmatrix}$ [Hots; Delhi 2008]

Q23. Using properties of determinants, prove the following

$$\begin{vmatrix} 3x & -x+y & -x+z \\ x-y & 3y & z-y \\ x-z & y-z & 3z \end{vmatrix}$$

$= 3(x+y+z)(xy+yz+zx)$. **[All ndia 013]**

Q24. Using properties of determinants, prove the following

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

$$= (a-b)(b-c)(c-a)(a+b+c)(a^2+b^2+c^2).$$ [All India 2012C]

Q25. Prove that

$$\begin{vmatrix} (a+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3.$$ [Delhi 2010, All India 2010C]

Q26. Using properties of determinants, prove that

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

$$= (1+a^2+b^2)^3.$$ [Delhi 2009, 2008]

Q27. A school wants to award its students for the values of honesty, regularity and hard work with a total cash award of Rs 6000. Three times the award money for hard work 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. Apart from these values, namely, honestly, regularity and hard work, suggest one more value which the school must include for award. [Value Based Question; Delhi 2013

According to second condition

3z + x = 11000

According to third condition

X + z = 2y

Q28. If A $\begin{bmatrix} 8 & -4 & 1 \\ 10 & 0 & 6 \\ 8 & 1 & 6 \end{bmatrix}$, then find A^{-1} and hence

Solve the following system of equations

$$8x - 4y + z = 5$$

$$10x + 6z = 4$$ [All India 2010C]

Q29. Using matrices, solve the following system of equations

$$2x + y + z = 7$$

$$x - y - z = -4$$

And $$3x + 2y + z = 10$$ [All India 2008C]