MATHS

BOOKS - OBJECTIVE RD SHARMA ENGLISH

DETERMINANTS

Illustration

1. $\begin{vmatrix} (\log)_3 512 & (\log)_4 3 \\ (\log)_3 8 & (\log)_4 9 \end{vmatrix} \times \begin{vmatrix} (\log)_2 3 & (\log)_8 3 \\ (\log)_3 4 & (\log)_3 4 \end{vmatrix} =$ (a) 7 (b) 10 (c) 13 (d) 17

A. 7

B. 10

C. 13

D. 17

Answer: B

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2. If [ ] denotes the greatest integer less than or equal to the real number under consideration, and $-1 \leq x < 0, \ \leq y < 1, 1 \leq z < 2,$ then find the value of the following determinant: $|[x] + 1[y][z][x][y] + 1[z][x][y][z] + 1|$

A. [z]

B. [y]

C. [x]

D. none of these

Answer: A

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3. If the lvalue of the determinants $\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix}$ is positive then:

A. $abc > 1$

B. $abc > -8$

C. $abc < -8$

D. $abc > -2$

Answer: B

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4. If $\begin{vmatrix} a & b & 0 \\ 0 & a & b \\ b & 0 & a \end{vmatrix} = 0$, then which one of the following is correct ?

A. a/b is one of the cube roots of unity

B. a is one of the cube roots of unity

C. b is one of the cube roots of unity

D. a/b is one of the cube roots of -1

Answer: D

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5. find the larget value of a third- order determinant whose elements are 0 or 1.

A. 1

B. 0

C. 2

D. 3

Answer: C

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6. 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

A. n

B. a

C. x

D. none of these

Answer: A

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7. Let $\begin{vmatrix} x^2+3x & x-1 & x+3 \\ x+1 & -2x & x-4 \\ x-3 & x+4 & 3x \end{vmatrix} = ax^4+bx^3+cx^2+e$ be an identity in x, where a, b, c, d, e are independent of $x \cdot$ Then the value of e is (a) 4 (b) 0 (c) 1 (d) none of these

A. 4

B. 0

C. 1

D. none of these

Answer: B

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8. The valaues of x for which the given matrix $\begin{bmatrix} -x & x & 2 \\ 2 & x & -x \\ x & -2 & -x \end{bmatrix}$ will be non-singular are

A. $-2 \leq x \leq -2$

B. for all x other than 2 and -2

C. $x > 2$

D. $x \leq -2$

Answer: B

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9. The sum of the products of the elements of any row of a matrix A with the corresponding cofactors of the elements of the same row is always equal to

A. $|A|$

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

C. 1

D. 0

Answer: A

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10. Let $\{D_1, D_2, D_3, D_n\}$ be the set of third order determinant that can be made with the distinct non-zero real numbers a_1, a_2, a_q. Then $\sum_{i=1}^{n} D_i = 1$ b. $\sum_{i=1}^{n} D_i = 0$ c. $D_i - D_j, \forall i, j$ d. none of these

A. $\sum_{i=1}^{n} D_i = 1$

B. $\underset{i=1_1}{\overset{n}{D}} = 0$

C. $D_i = D_j$ for all i, j

D. none of these

Answer: B

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11. If $\begin{vmatrix} a & b & c \\ m & n & p \\ x & y & z \end{vmatrix} = k$ then thet value of $\begin{vmatrix} 6a & 2b & 2c \\ 3m & n & p \\ 3x & y & z \end{vmatrix}$

A. $\frac{k}{6}$

B. 2k

C. 3k

D. 6k

Answer: D

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12. The value of $\begin{vmatrix} 5^2 & 5^3 & 5^4 \\ 5^3 & 5^4 & 5^5 \\ 5^4 & 5^5 & 5^6 \end{vmatrix}$ is (a)5^2 (b) 0 (c) 5^{13} (d) 5^9

A. 5^2

B. 0

C. 5^{13}

D. 5^9

Answer: B

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13. If every element of a third order determinant of value $Det < a$ is multiplied by 5, then the value of new determinant, is

A. Δ

B. 5Δ

C. 25Δ

D. 125Δ

Answer: D

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14. Let $P = [a_{ij}]$ be a 3×3 matrix and let $Q = [b_{ij}], where b_{ij} = 2^{i+j} a_{ij} f$ or $1 \leq i, j \leq 3$. If the determinant of P is 2, then the determinant of the matrix Q is 2^{10} b. 2^{11} c. 2^{12} d. 2^{13}

A. 2^{10}

B. 2^{11}

C. 2^{12}

D. 2^{13}

Answer: D

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15. If A is a square matrix such that $|A| = 2$, then for any positive integer n, $|A^n|$ is equal to

A. 2^n

B. n^2

C. 0

D. 2n

Answer: A

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16. If the value of a third order determinant is 11 then the value of the square of the determinant formed by the cofactors will be

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17. If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 5$, then the value of

$\Delta = \begin{vmatrix} b_2c_3 - b_3c_2 & a_3c_2 - a_2c_3 & a_2b_3 - a_3b_2 \\ b_3c_1 - b_1c_3 & a_1c_3 - a_3c_1 & a_3b_1 - a_1b_3 \\ b_1c_2 - b_2c_1 & a_2c_1 - a_1c_2 & a_1b_2 - a_2b_1 \end{vmatrix}$ is

A. 5

B. 25

C. 125

D. 0

Answer: B

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18. Let $\Delta_0 = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$ and Δ_1 denotes the determinant formed by the cofactors of elements of Δ_0 and Δ_2 denots the determinant formed by the cofactors of Δ_1 and so on Δ_n denotes the determinant formed by the cofactors of Δ_{n-1} is

A. $|A|^{2n}$

B. $|A|^{2n}$

C. $|A|^{n^2}$

D. $|A|^2$

Answer: B

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19. If A and B ar square matrices of order 3 such that |A|=-1|B|=3, then |3AB| is equal to

A. -9

B. -81

C. -27

D. 81

Answer: A

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20. If $\Delta = \begin{vmatrix} 0 & b-a & c-a \\ a-b & 0 & c-b \\ a-c & b-c & 0 \end{vmatrix}$, then Δ eqauals

A. $a+b+c$

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

C. abc

D. 0

Answer: D

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21. If w is an imaginary cube root of unity, find the value of $\begin{vmatrix} 1 & w & w^2 \\ w & w^2 & 1 \\ w^2 & 1 & w \end{vmatrix}$

.

A. 1

B. 0

C. w^2

D. w

Answer: B

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22. The value of $\Delta = \begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$, is

A. 1

B. -1

C. $a+b+c$

D. 0

Answer: D

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23. Show that $|b - \quad - aa - bc - aa - \quad - ca - \quad - \quad - a|$.

A. $a + b + c$

B. 0

C. 1

D. none of these

Answer: B

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24. Without expanding evaluate the determinant $|\sin\alpha\cos\alpha\sin(\alpha+\delta)\sin\beta\cos\beta\sin(\beta+\delta)\sin\gamma\cos\gamma\sin(\gamma+\delta)|$.

A. 0

B. $\sin\alpha\sin\beta\sin\gamma$

C. $\cos\alpha\cos\beta\cos\gamma$

D. none of these

Answer: A

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25. Without expanding evaluate the determinant

$$\begin{vmatrix} (a^x + a^{-x})^2 & (a^x - a^{-x})^2 & 1 \\ (a^y + a^{-y})^2 & (a^y - a^{-y})^2 & 1 \\ (a^z + a^{-z})^2 & (a^z - a^{-z})^2 & 1 \end{vmatrix}$$, where $a > 0$ and $x, y, z \in R$

A. 1

B. -1

C. 0

D. none of these

Answer: C

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26. Evaluate: $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$.

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

B. $(a^2-b^2)(b^2-c^2)(c^2-a^2)$

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

D. none of these

Answer: A

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27. $\Delta = \begin{vmatrix} a+x & b & c \\ b & x+c & a \\ c & a & x+b \end{vmatrix}$. Which of the following is a factor for the above determinant ?

A. $x-(a+b+c)$

B. $x+(a+b+c)$

C. $a+b+c$

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

Answer: B

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28. What is $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix}$ equal to ?

A. $4a^2b^2$

B. $4b^2c^2$

C. $4c^2a^2$

D. $4a^2b^2c^2$

Answer: D

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29. For $x \neq y \neq z$, $\begin{vmatrix} 1+x^3 & x^2 & 1 \\ 1+y^3 & y^2 & 1 \\ 1+z^3 & z^2 & 1 \end{vmatrix} = 0$ if xyz is

A. 0

B. positive

C. negative

D. none of these

Answer: A

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30. Let a , b and c be positive and not all equal. Show that the value of the determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is negative .

A. $+ive$

B. $-ive$

C. zero

D. none of these

Answer: B

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31. Let $\text{Delta}_r = \left| rx \frac{n(n+1)}{2} 2r - 1yn^2 3r - 2z \frac{n(3n-1)}{2} \right|$. Show that $\sum_{r=1}^{n} \text{Delta}_r = 0$

A. xyz

B. n xyz

C. 0

D. none of these

Answer: C

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32. If $\text{Delta}_r = \begin{vmatrix} 2^{r-1} & 2.\ 3^{r-1} & 4.\ 5^{r-1} \\ x & y & z \\ 2^n - 1 & 3^n - 1 & 5^n - 1 \end{vmatrix}$ Show that $\sum_{r=1}^{n} \text{Delta}_r$= Constant

A. xyz

B. 1

C. -1

D. 0

Answer: D

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33. Prove that:

$|abax + bybcbx + cyax + bybx + cy0| = (b^2 - ac)(ax^2 + 2bxy + cy^2)$

A. zero

B. positive

C. negative

D. $b^2 + ac$

Answer: C

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34. The value of the determinant $\begin{vmatrix} b+c & a-b & a \\ c+a & b-c & b \\ a+b & c-a & c \end{vmatrix}$, is

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

B. $3abc - a^3 - b^3 - c^3$

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

D. none of these

Answer: B

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35. Show that $\begin{bmatrix} a_1l_1+b_1m_1 & a_1l_2+b_1m_2 & a_1l_3+b_1m_3 \\ a_2l_1+b_2m_1 & +a_2l_2+b_2m_2 & a_2l_3+b_2m_3 \\ a_2l_1+b_3m_1 & +a_3l_2+b_2m_2 & a_3l_3+b_3m_3 \end{bmatrix}$

A. $a_1a_2a_3b_1b_2b_3$

B. $x_1x_2x_3y_1y_2y_3$

C. 0

D. none of these

Answer: C

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36. 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

A. $y_1y_2y_3z_1z_2z_3$

B. $y_1+y_2+y_3$

C. $z_1+z_2+z_3$

D. 0

Answer: D

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37. If α, β, γ are real numbers, then without expanding at any stage, show that

$$|1 \cos(\beta-\alpha)\cos(\gamma-\alpha)\cos(\alpha-\beta)1\cos(\gamma-\beta)\cos(\alpha-\gamma)\cos(\beta-\gamma)1| =$$

A. $\cos\alpha\cos\beta\cos\gamma$

B. $\cos\alpha+\cos\beta+\cos\gamma$

C. 1

D. 0

Answer: D

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38. 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

A. $l_3 m_3 n_3$

B. ± 1

C. $l_1 m_1 n_1$

D. $l_2 m_2 n_2$

Answer: B

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39. If $f(x), g(x)$ and $h(x)$ are three polynomials of degree 2 , then prove that $\phi(x) = \begin{vmatrix} f(x) & g(x) & h(x) \\ f'(x) & g'(x) & h'(x) \\ f''(x) & g''(x) & h''(x) \end{vmatrix}$ is a constant polynomial.

A. 2

B. 3

C. 4

D. none of these

Answer: D

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40. If $f, g, and\ h$ are differentiable functions of x and $d(x) = \begin{vmatrix} f & g & h \\ (xf)' & (xg)' & (xh)' \\ (x^2f)'' & (x^2g)'' & (x^2h)'' \end{vmatrix}$ prove that $d'(x) = \begin{vmatrix} f & g & h \\ f' & g' & h' \\ (x^3f'')' & (x^3g'')' & (x^3h'')' \end{vmatrix}$

A. 1

B. 2

C. 3

D. 4

Answer: C

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41. If $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ are vertices of an equilateral triangle whose each side is equal to a, then prove that

$\begin{vmatrix} x_1 & y_1 & 2 \\ x_2 & y_2 & 2 \\ x_3 & y_3 & 2 \end{vmatrix}$ is equal to

A. $2a^2$

B. $2a^4$

C. $3a^2$

D. $3a^4$

Answer: D

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42. If the system of equations $x - ky - z = 0, kx - y - z = 0, x + y - z = 0$ has a nonzero solution, then the possible value of k are a.$-1, 2$ b. $1, 2$ c. $0, 1$ d. $-1, 1$

A. $-1, 2$

B. $1, 2$

C. 0, 1

D. $-1, 1$

Answer: D

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43. If the system of equations $ax + by + c = 0, bx + cy + a = 0, cx + ay + b = 0$ has infinitely many solutions then the system of equations

$(b + c)x + (c + a)y + (a + b)z = 0$

$(c + a)x + (a + b)y + (b + c)z = 0$

$(a + b)x + (b + c)y + (c + a)z = 0$ has

A. only one solution

B. no solution

C. infinite number of solutions

D. none of these

Answer: C

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44. if $a > b > c$ and the system of equations $ax + by + cz = 0, bx + cy + az0$ and $cx + ay + bz = 0$ has a non-trivial solution, then the quadratic equation $ax^2 + bx + c = 0$ has

A. at least one positive root

B. roots opposite in sign

C. positive roots

D. imaginary roots

Answer: A

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45. The number of values of k for which the system of the equations $(k+1)x+8y=4k$ and $kx+(k+3)y=3k-1$ has infinitely many solutions is 0 b. 1 c. 2 d. infinite

A. 0

B. 1

C. 2

D. infinite

Answer: B

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Section I Solved Mcqs

1. If α, β and γ are the roots of the equation $x^3 + px + q = 0$ (with $p \neq 0$ and $p \neq 0$ and $q \neq 0$), the value of the determinant

$$\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}$$, is

A. p

B. q

C. $p^2 - 2q$

D. none of these

Answer: D

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2. If m is a positive integer and

$D_r = \left|2r - 1\,{}^mC_r 1m^2 - 12^m m + 1s \in^2 \left(m^2\right) s \in^2 (m) s \in^2 (m+1)\right|$.

Prove that $\sum_{r=0}^{m} D_r = 0$.

A. 0

B. $m^2 - 1$

C. 2^m

D. $2^m \sin^2(2^m)$

Answer: A

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3. if x,y ,z are in A.P. then the value of the determinant

$\begin{vmatrix} a+2 & a+3 & a+2x \\ a+3 & a+4 & a+2y \\ a+4 & a+5 & a+2x \end{vmatrix}$ is

A. 1

B. 0

C. 2a

D. a

Answer: B

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4. The value of the determinant $\begin{vmatrix} x+2 & x+3 & x+5 \\ x+4 & x+6 & x+9 \\ x+8 & x+11 & x+15 \end{vmatrix}$ is

A. 2

B. -2

C. 3

D. $x-1$

Answer: B

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5. If α, β, γ are roots of the equation $x^3+px+q=0$ then the value of $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}$ is

A. $-a^3$

B. $a^3 - 3b$

C. a^3

D. $a^2 - 3b$

Answer: C

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

A. $a(2a + 3x)$

B. $ax(2x + 3a)$

C. $ax(2a + 3x)$

D. $x(2a + 3x)$

Answer: C

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7. If a, b, c are real numbers, prove that $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = -(a+b+c)\left(c+bw+cw^2\right)\left(a+bw^2+cw\right),$ where w is a complex cube root of unity.

A. 1

B. -1

C. ω

D. $-\omega$

Answer: C

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8. If $\omega$is an imaginary cube root of unity, then the value of the determinant $\begin{vmatrix} 1+\omega & \omega^2 & -\omega \\ 1+\omega^2 & \omega & -\omega^2 \\ \omega+\omega^2 & \omega & -\omega^2 \end{vmatrix}$

A. 0

B. 2ω

C. $2\omega^2$

D. $-3\omega^2$

Answer: D

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9. If $\begin{vmatrix} x^n & x^{n+2} & x^{n+3} \\ y^n & y^{n+2} & y^{n+3} \\ z^n & z^{n+2} & z^{n+3} \end{vmatrix} = (x-y)(y-z)(z-x)\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$,

then n equals a. 1 b. -1 c. 2 d. -2

A. 1

B. -1

C. 2

D. -2

Answer: B

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10. Let $f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$ then f(100) is equal to

A. 0

B. 1

C. 100

D. -100

Answer: A

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11. Given $a_i^2 + b_i^2 + c_i^2 = 1, i = 1, 2, 3$ and $a_i a_j + b_i b_j + c_i c_j = 0 (i \neq j, i, j = 1, 2, 3$

, then the value of the determinant

$$\begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}, \text{ is}$$

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

B. 0

C. 2

D. 1

Answer: D

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12. If α, β and γ are such that $\alpha + \beta + \gamma = 0,$ then

$$\begin{vmatrix} 1 & \cos\gamma & \cos\beta \\ \cos\gamma & 1 & \cos\alpha \\ \cos\beta & \cos\alpha & 1 \end{vmatrix}$$

A. $\cos\alpha\cos\beta\cos\gamma$

B. $\cos\alpha+\cos\beta+\cos\gamma$

C. 1

D. none of these

Answer: D

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13. If $f(\alpha,\beta)=\begin{vmatrix}\cos\alpha & -\sin\alpha & 1\\ \sin\alpha & \cos\alpha & 1\\ \cos(\alpha+\beta) & -\sin(\alpha+\beta) & 1\end{vmatrix}$ then

A. independent of α

B. independent of β

C. independent of α and β

D. none of these

Answer: A

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14. If $f(\alpha, \beta) = \begin{vmatrix} \cos\alpha & -\sin\alpha & 1 \\ \sin\alpha & \cos\alpha & 1 \\ \cos(\alpha+\beta) & -\sin(\alpha+\beta) & 1 \end{vmatrix}$ then

A. $\Delta \in \left[1-\sqrt{2}, 1+\sqrt{2}\right]$

B. $\Delta \in [-1, 1]$

C. $\Delta \in \left[-\sqrt{2}\sqrt{2}\right]$

D. none of these

Answer: A

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15. Let $D_r = \begin{vmatrix} a & 2^r & 2^{16}-1 \\ b & 3(4^r) & 2\left(4^{16}-1\right) \\ c & 7(8^r) & 4\left(8^{16}-1\right) \end{vmatrix}$, then the value of $\sum_{k=1}^{16} D_k$, is (a) 0 (b) $a+b+c$ (c)$ab+bc+ca$ (d) 1

A. 0

B. $a+b+c$

C. $ab+bc+ca$

D. none of these

Answer: A

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16. 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

A. $\cos\alpha_1\cos\alpha_2\cos\alpha_3\cos\beta_1\cos\beta_2\cos\beta_3$

B. $\cos\alpha_1+\cos\alpha_2+\cos\alpha_3+\cos\beta_1+\cos\beta_2+\cos\beta_3$

C. $\cos(\alpha_1-\beta_1)\cos(\alpha_2-\beta_2)\cos(\alpha_3-\beta_3)$

D. none of these

Answer: D

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17. The determinant $\begin{vmatrix} y^2 & -xy & x^2 \\ a & b & c \\ a' & b' & c' \end{vmatrix}$ is equal to

A. $\begin{vmatrix} bx+ay & cx+by \\ b'x+a'y & c'x+b'y \end{vmatrix}$

B. $\begin{vmatrix} ax+by & bx+cy \\ a'x+b'y & b'x+c'y \end{vmatrix}$

C. $\begin{vmatrix} bx+cy & ax+by \\ b'x+c'y & d'x+b'y \end{vmatrix}$

D. none of these

Answer: B

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18. If $\begin{vmatrix} p & q-y & r-z \\ p-x & q & r-z \\ p-x & q-y & r \end{vmatrix} = 0$ find the value of $\frac{p}{x}+\frac{q}{y}+\frac{r}{z}$

A. 0

B. 1

C. 2

D. 4 pqr

Answer: C

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19. 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 $-\frac{\pi}{4} \leq x \leq t\frac{\pi}{4}$ is

A. 0

B. 2

C. 1

D. 3

Answer: C

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20. The value of a for which system of equations , $a^3x + (a+1)^3 y + (a+2)^3 z = 0, ax + (a+1)y + (a+2)z = 0, x + y +$

has a non-zero solution is:

A. 0

B. -1

C. 1

D. none of these

Answer: B

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21. 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, which of the following is not correct ?

A. $D = 0$

B. $D \in (0, \infty)$

C. $D \in [2, 4]$

D. $D \in [2, \infty)$

Answer: C

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22. Let $\begin{vmatrix} x & 2 & x \\ x^2 & x & 6 \\ x & x & 6 \end{vmatrix} = Ax^4 + Bx^3 + Cx^2 + Dx + E$. Then the value of $5A + 4B + 3C + 2D + E$ is equal to a. zero b. -16 c. 11 d. -11

A. 0

B. -16

C. 16

D. none of these

Answer: D

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23. If $A = \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}, B = \begin{vmatrix} 1 & bc & a \\ 1 & ca & b \\ 1 & ab & c \end{vmatrix}$, then

A. $\Delta_1 + \Delta_2 = 0$

B. $\Delta_1 + 2\Delta_2 = 0$

C. $\Delta_1 = \Delta_2$

D. none of these

Answer: A

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24. If $D_k = |1 \cap 2kn^2 + n + 2n^2 + n2k - 1n^2n^2 + n + 2| and \sum_{k=1}^{n} D_k = 48, the \cap equals$ 4 (b) 6 (c) 8 (d) none of these

A. 4

B. 6

C. 8

D. none of these

Answer: A

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25. Let $\begin{vmatrix} x^2+3x & x-1 & x+3 \\ x+1 & -2x & x-4 \\ x-3 & x+4 & 3x \end{vmatrix} = ax^4+bx^3+cx^2+e$ be an identity in x, where a, b, c, d, e are independent of x. Then the value of e is (a) 4 (b) 0 (c) 1 (d) none of these

A. 3

B. 2

C. 4

D. none of these

Answer: A

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26. If $A=\int_1^{\sin\theta}\frac{t}{1+r^2}dt$ and $B=\int_1^{\text{cosec}\theta}\frac{1}{t(1+t^2)}dt$, then the value of the determinant

$$\begin{vmatrix} A & A^2 & B \\ e^{A+B} & B^2 & -1 \\ 1 & A^2+B^2 & -1 \end{vmatrix}$$ is

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27. If $I_n=\begin{vmatrix} 1 & k & k \\ 2n & k^2+k+1 & k^2+k \\ 2n-1 & k^2 & k^2+k+1 \end{vmatrix}$ and $\sum_{n=1}^{k} I_n=72$, then k =

A. 8

B. 9

C. 6

D. none of these

Answer: A

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28. If x is a positive integer, then $\begin{vmatrix} x! & (x+1)! & (x+2)! \\ (x+1)! & (x+2)! & (x+3)! \\ (x+2)! & (x+3)! & (x+4)! \end{vmatrix}$ is equal to

A. $2x!(x+1)!$

B. $2x!(x+1)!(x+2)!$

C. $2x!(x+3)!$

D. $2(x+1)!(x+2)!(x_3)!$

Answer: B

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29. If $f(x) = \begin{vmatrix} x+\lambda & x & x \\ x & x+\lambda & x \\ x & x & x+\lambda \end{vmatrix}, \quad \text{then} \quad f(3x) - f(x) =$

A. $3x\lambda^2$

B. $6x\lambda^2$

C. $x\lambda^2$

D. none of these

Answer: B

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30. Find the value of the determinant $\begin{vmatrix} bc & ca & ab \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$, where a, b, and c are respectively, the pth, qth, and rth terms of a harmonic progression.

A. 0

B. abc

C. pqr

D. none of these

Answer: A

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31. The value of the determinant $\begin{vmatrix} \sin\theta & \cos\theta & \sin 2\theta \\ \sin\left(\theta + \frac{2\pi}{3}\right) & \cos\left(\theta + \frac{2\pi}{3}\right) & \sin\left(2\theta + \frac{4\pi}{3}\right) \\ \sin\left(\theta - \frac{2\pi}{3}\right) & \cos\left(\theta - \frac{2\pi}{3}\right) & \sin\left(2\theta - \frac{4\pi}{3}\right) \end{vmatrix}$

A. $\sin\theta$

B. $\cos\theta$

C. $\sin\theta\cos\theta$

D. none of these

Answer: D

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32. If a, b, c are distinct, then the value of x satisfying $\left|0x^2 - ax^3 - bx^2 + a0x^2 + cx^4 + bx - c0\right| = 0is$ c (b) a (c) b (d) 0

A. c

B. a

C. b

D. 0

Answer: D

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33. If the determinant $\begin{vmatrix} a & b & 2a\alpha+3b \\ b & c & 2b\alpha+3c \\ 2a\alpha+3b & 2b\alpha+3c & 0 \end{vmatrix}=0$ then (a) a, b, c are in H.P. (b) α is root of $4ax^2+12bx+9c=0$ or(c) a, b, c are in G.P. (d) $a, b, c,$ are in G.P. only a, b, c are in A.P.

A. a, b, c are in H.P.

B. α is a root of $4ax^2+12bx+9c=0$ or , a, b, c are in G.P.

C. a, b, c are in G.P. only

D. a, b, c are in A.P.

Answer: B

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34. if the system of linear equations

$x + 2ay + az = 0$

$x + 3by + bz = 0$

$x + 4cy + cz = 0$

has a non zero solution then a,b,c are in

A. H.P.

B. G.P.

C. A.P.

D. none of these

Answer: A

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35. If α is a non-real cube root of -2, then the value of $\begin{vmatrix} 1 & 2\alpha & 1 \\ \alpha^2 & 1 & 3\alpha^2 \\ 2 & 2\alpha & 1 \end{vmatrix}$, is

A. -11

B. -12

C. -13

D. 0

Answer: C

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36. The value of the determinant

$$\Delta = \begin{vmatrix} \cos(\alpha+\beta) & -\sin(\alpha+\beta) & \cos 2\beta \\ \sin\alpha & \cos\alpha & \sin\beta \\ -\cos\alpha & \sin\alpha & -\cos\beta \end{vmatrix}, \text{ is}$$

A. $\cos^2\alpha$

B. $\sin^2\alpha$

C. $\sin(\alpha - \beta)$

D. 0

Answer: D

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37. If ω is a non-real cube root of unity and n is not a multiple of 3, then

$= \left|1\omega^n\omega^{2n}\omega^{2n}1\omega^n\omega^n\omega^{2n}1\right|$ is equal to (a) 0 (b) ω (c) ω^2 (d) 1

A. 0

B. ω

C. ω^2

D. 1

Answer: A

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38. If ω is a non-real cube root of unity, then $\Delta = \begin{vmatrix} a_1 + b_1\omega & a_1\omega^2 + b_1 & a_1 + b_1 + c_1\omega^2 \\ a_2 + b_2\omega & a_2\omega^2 + b_2 & a_2 + b_2 + c_2\omega^2 \\ a_3 + b_3\omega & a_3\omega^2 + b_3 & a_3 + b_3 + c_3\omega^2 \end{vmatrix}$ is equal to

A. -1

B. 0

C. $-\omega^2$

D. none of these

Answer: B

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39. If $\Delta_r = \begin{vmatrix} 1 & r & 2^r \\ 2 & n & n^2 \\ n & \frac{n(n+1)}{2} & 2^{n+1} \end{vmatrix}$, then the value of $\sum_{r=1}^{n} \Delta_r$ is

A. n

B. 2n

C. $-2n$

D. n^2

Answer: C

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40. If $\Delta_r = \begin{vmatrix} 2^{r-1} & \frac{(r+1)!}{(1+1/r)} & 2r \\ a & b & c \\ 2^n - 1 & (n+1)! - 1 & n(n+1) \end{vmatrix}$, then $\sum_{r=1}^{n} \Delta_r$ is equal to

A. 0

B. $n + 3!$

C. $a(n!) + b$

D. none of these

Answer: A

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41. The value of the determinant $\Delta = \begin{vmatrix} 1+a_1b_1 & 1+a_1b_2 & 1+a_1b_3 \\ 1+a_2b_1 & 1+a_2b_2 & 1+a_2b_3 \\ 1+a_3b_1 & 1+a_3b_2 & 1+a_3b_3 \end{vmatrix}$, is

A. $a_1a_2a_3 + b_1b_2b_3$

B. $(a_1a_2a_3)(b_1b_2b_3)$

C. $a_1a_2b_1b_2 + a_2a_3b_2b_3 + a_3a_1b_3b_1$

D. none of these

Answer: D

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42. If a,b,c are comples number and z= $\begin{vmatrix} 0 & -b & -c \\ \bar{b} & 0 & -a \\ \bar{c} & \bar{a} & 0 \end{vmatrix}$ then show tha z is purely imaginary

A. is a non-zero real number

B. purely imaginary

C. 0

D. none of these

Answer: B

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43. The value of the determinant $\Delta = \begin{vmatrix} \sin 2\alpha & \sin(\alpha+\beta) & \sin(\alpha+\gamma) \\ \sin(\beta+\gamma) & \sin 2\beta & \sin(\gamma+\beta) \\ (\sin\gamma+\alpha) & \sin(\gamma+\beta) & \sin 2\gamma \end{vmatrix}$, is

A. 0

B. $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$

C. $\frac{3}{2}$

D. none of these

Answer: A

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44. If A, B and C denote the angles of a triangle, then

$$\Delta = \begin{vmatrix} -1 & \cos C & \cos B \\ \cos C & -1 & \cos A \\ \cos B & \cos A & -2 \end{vmatrix}$$ is independent of

A. A

B. B

C. C

D. none of these

Answer: B

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45. If X,Y and Z are opositive number such that Y and Z have respectively 1 and 0 at their unit's place and

$$\Delta = \begin{vmatrix} X & 4 & 1 \\ Y & 0 & 1 \\ Z & 1 & 0 \end{vmatrix}$$

If $(\Delta + 1)$ is divisible by 10 then X has at its unit's place

A. 1

B. 0

C. 2

D. none of these

Answer: C

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46. If $a > 0$ and discriminant of $ax^2 + 2bx + c$ is negative, then $\begin{vmatrix} a & b & ax+b \\ b & c & bx+c \\ ax+b & bx+c & 0 \end{vmatrix}$ is a. $+ve$ b. $(ac - b)^2 (ax^2 + 2bx + c)$ c. $-ve$ d. 0

A. positive

B. $(ac - b^2)(ax^2 + 2bx + c)$

C. negative

D. 0

Answer: C

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47. If $C = 2\cos\theta$, then the value of the determinant $\Delta = \begin{vmatrix} C & 1 & 0 \\ 1 & C & 1 \\ 6 & 1 & c \end{vmatrix}$, is

A. $\dfrac{\sin 4\theta}{\sin\theta}$

B. $\dfrac{2\sin^2 2\theta}{\sin\theta}$

C. $4\cos^2\theta(2\cos\theta - 1)$

D. none of these

Answer: D

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48. If

$x^a y^b = e^m, x^c y^d = e^n, \Delta_1 = \begin{vmatrix} m & b \\ n & d \end{vmatrix}$, and $\Delta_2 = \begin{vmatrix} a & m \\ c & n \end{vmatrix}$ and $\Delta_3 = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$

then the values of x and y are

A. $\frac{\Delta_1}{\Delta_3}$ and $\frac{\Delta_2}{\Delta_3}$

B. $\frac{\Delta_2}{\Delta_1}$ and $\frac{\Delta_3}{\Delta_1}$

C. $\log\left(\frac{\Delta_1}{\Delta_3}\right), \log\left(\frac{\Delta_2}{\Delta_3}\right)$

D. e^{Δ_1 / Δ_3} and e^{Δ_2 / Δ_3}

Answer: D

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49. If s=(a+b+c),then value of $\begin{vmatrix} s+c & a & b \\ c & s+a & b \\ c & a & s+b \end{vmatrix}$ is

A. $2s^2$

B. $2s^3$

C. s^3

D. $3s^3$

Answer: B

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50. Let $a, bandc$ detnote the sides $BC, CAandAB$ respectively of $ABC\cdot$

If $|1ab1ca1bc| = 0$

A. $\frac{9}{4}$

B. $\frac{4}{9}$

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

D. 1

Answer: A

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51. If ω is a complex cube root of unity, then a root of the equation

$$\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix} = 0, \text{ is}$$

A. x = 1

B. $x = \omega$

C. $x = \omega^2$

D. $x = 0$

Answer: D

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52. $\Delta = \begin{vmatrix} 1 & 1+ac & 1+bc \\ 1 & 1+ad & 1+bd \\ 1 & 1+ae & 1+be \end{vmatrix}$ is independent of

A. 1

B. 0

C. 3

D. $a + b + c$

Answer: B

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53. If the system of equations $x + ay = 0, az + y = 0, and ax + z = 0$ has infinite solutions, then the value of equation has no solution is -3 b. 1 c. 0 d. 3

A. -1

B. 1

C. 0

D. no real values

Answer: A

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54. if the system of linear equations

$x+2ay+az=0$
$x+3by+bz=0$
$x+4cy+cz=0$

has a non zero solution then a,b,c are in

A. satisfy $a+2b+3c=0$

B. are in A.P.

C. are in G.P.

D. are in H.P.

Answer: D

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55. Given, $2x-y+2z=2, x-2y+z=-4, x+y+\lambda z=4$,then the value of λ such that the given system of equations has no solution, is

A. 3

B. 1

C. 0

D. -3

Answer: B

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56. Evaluate: $= \begin{vmatrix} 10! & 11! & 12! \\ 11! & 12! & 13! \\ 12! & 13! & 14! \end{vmatrix}$

A. $2(10!11!)$

B. $2(10!13!)$

C. $2(10!11!12!)$

D. $2(11!12!13!)$

Answer: C

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57. If $A = \begin{vmatrix} \sin(\theta+\alpha) & \cos(\theta+\alpha) & 1 \\ \sin(\theta+\beta) & \cos(\theta+\beta) & 1 \\ \sin(\theta+\gamma) & \cos(\theta+\gamma) & 1 \end{vmatrix}$, then

A. $A = 0 \quad \text{for all} \quad \theta$

B. A is an odd function of θ

C. A = 0 for $\theta = \alpha + \beta + \gamma$

D. A is independent of θ

Answer: D

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

A. 3

B. 2

C. 1

D. 0

Answer: B

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59. If $a = 1 + 2 + 4 + \ldots$ up to n terms

$b = 1 + 3 + 9 + \ldots$ up to n terms

and $c = 1 + 5 + 25 + \ldots.$ up to n terms.

then $\Delta = \begin{vmatrix} a & 2b & 4c \\ 2 & 2 & 2 \\ 2^n & 3^n & 5^n \end{vmatrix} =$

A. 30^n

B. 10^n

C. 0

D. $2^n + 3^n + 5^n$

Answer: C

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60. If $D_r = \begin{vmatrix} r & 1 & \frac{n(n+1)}{2} \\ 2r-1 & 4 & n^2 \\ 2^{r-1} & 5 & 2^n - 1 \end{vmatrix}$, then the value of $\sum_{r=1}^{n} D_r$, is

A. 0

B. 1

C. $\dfrac{n(n+1)(2n+1)}{6}$

D. none of these

Answer: A

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61. If $a^2 + b^2 + c^2 = -2 and f(x) =$

$|1 + a^2 x(1+b^2)x(1+c^2)x(1+a^2)x1+b^2x(1+c^2)x(1+a^2)x(1+b^2)x$

, then $f(x)$ is a polynomial of degree 0 b. 1 c. 2 d. 3

A. 2

B. 3

C. 0

D. 1

Answer: A

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62. The system of equations $\alpha x + y + z = \alpha - 1, x + \alpha y + z = \alpha - 1, x + y + \alpha z = \alpha - 1$ has no solution if alpha is (A) 1 (B) not -2 (C) either -2 or 1 (D) -2

A. 1

B. not -2

C. either -2 or 1

D. -2

Answer: D

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63. Let a,b,c be such that b(a+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 even integer

C. any odd integer

D. any integer

Answer: C

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64. If 3^n is a factor of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ .^n C_1 & .^{n+3} C_1 & .^{n+6} C_1 \\ .^n C_2 & .^{n+3} C_2 & .^{n+6} C_2 \end{vmatrix}$ then the maximum value of n is ....

A. 7

B. 5

C. 3

D. 1

Answer: C

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65. The number of 3 x 3 non-singular matrices, with four entries as 1 and all other entries as 0, is:- (1) 5 (2) 6 (3) at least 7 (4) less than 4

A. 6

B. at least 7

C. less than 4

D. 5

Answer: B

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66. consider the system of linear equations

$x_1 + 2x_2 + x_3 = 3$

$2x_1 + 3x_2 + x_3 = 3,$

$3x_1 + 5x_2 + 2x_3 = 1$

the system has

A. a unique solution

B. no solution

C. infinite number of solutions

D. exactly three solution

Answer: B

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67. If $f(\theta)=\begin{vmatrix}1 & \tan\theta & 1\\ -\tan\theta & 1 & \tan\theta\\ -1 & -\tan\theta & 1\end{vmatrix}$, then the set $\left\{f(\theta): 0\le\theta\le\frac{\pi}{2}\right\}$ is

A. $(-\infty, 0]\cup[2, \infty)$

B. $[2, \infty)$

C. $(-\infty, 0)\cup(0, \infty)$

D. $(-\infty, -1]\cup[1, \infty)$

Answer: B

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68. If a, b, c are non zero complex numbers satisfying $a^2+b^2+c^2=0$ and $\begin{vmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ac & bc & a^2+b^2 \end{vmatrix} = ka^2b^2c^2$, then k is equal to

A. 3

B. 2

C. 4

D. 1

Answer: C

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69. In a ΔABC if $\begin{vmatrix} 1 & a & b \\ 1 & c & a \\ 1 & b & c \end{vmatrix} = 0$, then $\sin^2 A + \sin^2 B + \sin^2 C$ is

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

B. $\frac{9}{4}$

C. $\frac{5}{4}$

D. 2

Answer: B

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70. Which of the following values of α satisfying the equation

$\left|(1+\alpha)^2(1+2\alpha)^2(1+3\alpha)^2(2+\alpha)^2(2+2\alpha)^2(2+3\alpha)^2(3+\alpha)^2(3+2\alpha)\right.$

-4 b. 9 c. -9 d. 4

A. -4

B. 9

C. -9

D. 4

Answer: B::C

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71. 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,

A. contains two elements

B. contains more than two elements

C. is an empty set

D. is a singleton set

Answer: A

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72. If $a^2+b^2+c^2+ab+bc+ca \le 0 \forall a, b, c \in R$, then value of the determinant $\begin{vmatrix} (a+b+2)^2 & a^2+b^2 & 1 \\ 1 & (b+c+2)^2 & b^2+c^2 \\ c^2+a^2 & 1 & (c+a+2)^2 \end{vmatrix}$ equals

A. 65

B. $a^2+b^2+c^2+31$

C. $4(a^2+b^2+c^2)$

D. 0

Answer: A

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73. For all values of $\theta \in \left(0, \frac{\pi}{2}\right)$, the determinant of the matrix $\begin{bmatrix} -2 & \tan\theta+\sec^2\theta & 3 \\ -\sin\theta & \cos\theta & \sin\theta \\ -3 & -4 & 3 \end{bmatrix}$ always lies in the interval :

A. $\left[\frac{7}{2}, \frac{21}{4}\right]$

B. [3, 5]

C. (4, 6)

D. $\left(\frac{5}{2}, \frac{19}{4}\right)$

Answer: B

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74. The total number of distinct $x \in R$ for which

$$\begin{vmatrix} x & x^2 & 1+x^3 \\ 2x & 4x^2 & 1+8x^3 \\ 3x & 9x^2 & 1+27x^3 \end{vmatrix} = 10 \quad \text{is} \quad \_\_\_\_$$

A. 1

B. 2

C. 3

D. 4

Answer: B

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Section Ii Assertion Reason Type

1. Consider the system of equations

x-2y+3z=-1

-x+y-2z=k

x-3y+4z=1

Statement -1 The system of equation has no solutions for $k \neq 3$.

statement -2 The determinant $\begin{vmatrix} 1 & 3 & -1 \\ -1 & -2 & k \\ 1 & 4 & 1 \end{vmatrix} \neq 0, \text{for} \quad k \neq 3.$

A. Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 1

B. Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanation for Statement 1

C. Statement 1 is true, Statement 2 is False

D. Statement 1 is False, Statement 2 is true

Answer: A

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2. If α, β, γ are real numbers, then without expanding at any stage, show that

$$|1 \cos(\beta-\alpha)\cos(\gamma-\alpha)\cos(\alpha-\beta)1\cos(\gamma-\beta)\cos(\alpha-\gamma)\cos(\beta-\gamma)1| =$$

A. Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 2

B. Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanation for Statement 2

C. Statement 1 is true, Statement 2 is False

D. Statement 1 is False, Statement 2 is true

Answer: A

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3. Consider the system of equations

$(a-1)x-y-z=0$

$x-(b-1)y+z=0$

$x+y-(c-1)z=0$

Where a, b and c are non-zero real number

Statement1 : If x,y,z are not all zero, then $ab+bc+ca=abc$

Statement 2 : $abc \geq 27$

A. Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 3

B. Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanation for Statement 3

C. Statement 1 is true, Statement 2 is False

D. Statement 1 is False, Statement 2 is true

Answer: B

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4. Statement-1:If A=

$$\begin{bmatrix} a^2+x^2 & ab-cx & ac+bx \\ ab+xc & +b^2+x^2 & +bc-ax \\ ac-bx & bc+ax & c^2+x^2 \end{bmatrix} \text{ and } B=\begin{bmatrix} x & c & -b \\ -c & x & a \\ b & -a & x \end{bmatrix} \text{then} |A|$$

A. Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 4

B. Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanation for Statement 4

C. Statement 1 is true, Statement 2 is False

D. Statement 1 is False, Statement 2 is true

Answer: A

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5. Let a, b, c be distinct real number and D be the determinant given by

$$D=\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix}$$

Statement1 : If $D > 0 \text{ then } abc > -8$

Statement - 2: $A.M. > G.M.$.

A. Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 5

B. Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanation for Statement 5

C. Statement 1 is true, Statement 2 is False

D. Statement 1 is False, Statement 2 is true

Answer: A

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6. Statement-1:Determination of a skew-symmetric matrix of order 3 is zero.

Statement-2: For any matrix $\det(A)^T = \det(A) = -\det(A)$.

Where det(B) denotes the determinant of matrix B. Then:

A. Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 6

B. Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanation for Statement 6

C. Statement 1 is true, Statement 2 is False

D. Statement 1 is False, Statement 2 is true

Answer: C

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Exercise

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

A. 3

B. -3

C. 0

D. none of these

Answer: C

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2. If $p+q+r=0=a+b+c,$ then the value of the determinant $\begin{vmatrix} pa & qb & rc \\ qc & ra & pb \\ rb & pc & qa \end{vmatrix} is$ (a)0 (b) $pa+qb+rc$ (c) 1 (d) none of these

A. 0

B. $pa+qb+rc$

C. 1

D. none of these

Answer: A

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3. about to only mathematics

A. 1

B. 0

C. -1

D. none of these

Answer: B

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4. If A is an invertible matrix then $\det(A^{-1})$ is equal to (A) 1 (B) $\frac{1}{|A|}$ (C) $|A|$ (D) none of these

A. det(A)

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

C. 1

D. none of these

Answer: B

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5. The value of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ .^m C_1 & .^{m+1} C_1 & .^{m+2} C_1 \\ .^m C_2 & .^{m+1} C_1 & .^{m+2} C_2 \end{vmatrix}$ is equal to

A. 1

B. -1

C. 0

D. none of these

Answer: A

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6. If A, B, C are the angles of a triangle, then the determinant

$$\Delta = \begin{vmatrix} \sin 2A & \sin C & \sin B \\ \sin C & \sin 2B & \sin A \\ \sin B & \sin A & \sin 2C \end{vmatrix}$$ is equal to

A. 1

B. -1

C. $\sin A + \sin B + \sin C$

D. none of these

Answer: D

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7. The determinant $\Delta = \begin{vmatrix} a^2 + x & ab & ac \\ ab & b^2 + x & bc \\ ac & bc & c^2 + x \end{vmatrix}$ is divisible by

A. x^5

B. x^4

C. x^4+1

D. x^4-1

Answer: B

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8. If $\_r=|2^r 2.3^r-14.5^r-1\alpha\beta\gamma 2^n-13^n-15^n-1|$, then find the value of $\cdot$

A. $\alpha\beta\gamma$

B. $2^n\alpha+2^n\beta+4^n\gamma$

C. $2\alpha+3\beta+4\gamma$

D. none of these

Answer: D

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9. Find the non-zero roots of the equation.

$$(i)\Delta = \begin{vmatrix} a & b & ax+b \\ b & c & bx+c \\ ax+b & bx+c & c \end{vmatrix} = 0$$

A. a,b ,c are in A.P

B. a, b, c are in G.P

C. a, b, c are in H.P

D. α is a root of $ax^2+bx+c=0$

Answer: B

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10. Let $\Delta_a = \begin{vmatrix} (a-1) & n & 6 \\ (a-1)^2 & 2n^2 & 4m-2 \\ (a-1)^3 & 3n^3 & 3n^2-3n \end{vmatrix}$ the value of $\sum_{a=1}^{n} \Delta_a$ is

A. 0

B. 1

C. $\left\{\frac{n(n+1)}{2}\right\}\left\{\frac{a(a+1)}{2}\right\}$

D. none of these

Answer: A

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11. if $a_1, a_2, \ldots\ldots a_n, \ldots\ldots$ form a G.P. and $a_1 > 0$, for all $I \geq 1$

$$\begin{vmatrix} \log a_n, & \log a_n + \log a_{n+2}, & \log a_{n+2} \\ \log a_{n+3}, & \log a_{n+3} + \log a_{n+5}, & \log a_{n+5} \\ \log a_{n+6}, & \log_{n+6} + \log a_{n+8}, & \log a_{n+8} \end{vmatrix}$$

A. 0

B. 1

C. 2

D. none of these

Answer: A

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12. For $x \neq y \neq z$, $\begin{vmatrix} 1+x^3 & x^2 & 1 \\ 1+y^3 & y^2 & 1 \\ 1+z^3 & z^2 & 1 \end{vmatrix} = 0$ if xyz is

A. -2

B. -1

C. -3

D. none of these

Answer: B

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13. if $\begin{vmatrix} b+c & c+a & a+b \\ a+b & b+c & c+a \\ c+a & a+b & b+c \end{vmatrix} = k \begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix}$ then the value of k is

A. 1

B. 2

C. 3

D. 4

Answer: B

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14. If A is a square matrix of order n such that its elements are polynomila in x and its r-rows become identical for x = k, then

A. $(x-k)^r$ is a factor of $|A|$

B. $(x-k)^r-1$ is a factor of $|A|$

C. $(x-k)^r+1$ is a factor $|A|$

D. $(x+k)^r$ is a factor of $|A|$

Answer: A

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15. Prove the identities: $\begin{vmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ca & bc & a^2+b^2 \end{vmatrix} = 4a^2b^2c^2$

A. 2

B. 1

C. 4

D. 3

Answer: C

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16. $a^{-1}+b^{-1}+c^{-1}=0$ such that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = \triangle$ then the value of $\triangle$ is

A. 0

B. abc

C. $-abc$

D. none of these

Answer: B

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17. If α, β, γ are real numbers, then without expanding at any stage, show that

$|1 \cos(\beta - \alpha)\cos(\gamma - \alpha)\cos(\alpha - \beta)1\cos(\gamma - \beta)\cos(\alpha - \gamma)\cos(\beta - \gamma)1| =$

A. $4 \cos \alpha \cos \beta \cos \gamma$

B. $2 \cos \alpha \cos \beta \cos \gamma$

C. $4 \sin \alpha \sin \beta \sin \gamma$

D. none of these

Answer: D

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18. If A,B,C are the angles of triangle ABC, then the minimum value of $\begin{vmatrix} -1 & \cos C & \cos B \\ \cos C & -1 & \cos A \\ \cos B & \cos A & -1 \end{vmatrix}$ is equal to :

A. $\cos A \cos B \cos C$

B. $\sin A \sin B \sin C$

C. 0

D. none of these

Answer: C

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19. If x, y , z are in A.P., then the value of the det (A) is , where

$$A = \begin{bmatrix} 4 & 5 & 6 & x \\ 5 & 6 & 7 & y \\ 6 & 7 & 8 & z \\ x & y & z & 0 \end{bmatrix}$$

A. 0

B. 1

C. 2

D. none of these

Answer: A

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20. Find the number of real root of the equation $|0x - ax - bx + a0x - cx + bx + c0| = 0, a \neq b \neq candb(a + c) > ac$

A. a

B. b

C. c

D. 0

Answer: D

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21. If a, b, c are distinct, then the value of x satisfying $\left|0x^2 - ax^3 - bx^2 + a0x^2 + cx^4 + bx - c0\right| = 0is$ c (b) a (c) b (d) 0

A. a

B. b

C. c

D. 0

Answer: D

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22. Let the following system of equations

$kx + y + z = 1$
$x + ky + z = k$
$x + y + kz = k^2$

has no solution . Find |k|.

A. 0

B. 1

C. -1

D. -2

Answer: D

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23. Show that: $\left|b^2+c^2abacbac^2+a^2bccacba^2+b^2\right|=4a^2b^2c^2$

A. 3

B. 2

C. 4

D. none of these

Answer: C

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24. Let $\triangle = \begin{vmatrix} 2a_1b_1 & a_1b_2 + a_2b_1 & a_1b_3 + a_3b_1 \\ a_1b_2 + a_2b_1 & 2a_2b_2 & a_2b_3 + a_3b_2 \\ a_1b_3 + a_3b_1 & a_3b_2 + a_2b_3 & 2a_3b_3 \end{vmatrix}$. Expressing as the product of two determinants, show that $\triangle = 0$

A. 1

B. -1

C. 0

D. $a_1a_2a_3b_1b_2b_3$

Answer: C

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25. If B is a non-sinfular matrix and A is square matrix, then det $B^{-1}AB$is equal to

A. Det (B)

B. Det(A)

C. Det $\left(B^{-1}\right)$

D. Det $\left(A^{-1}\right)$

Answer: B

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26. If $0 < \theta < \pi$ and the system of equations

$(\sin\theta)x + y + z = 0$

$x + (\cos\theta)y + z = 0$

$(\sin\theta)x + (\cos\theta)y + z = 0$

has a non-trivial solution, then $\theta =$

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

Answer: D

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27. If the determinant $\begin{vmatrix} b-c & c-a & a-b \\ b'-c' & c'-a' & a'-b' \\ b''-c'' & c''-a'' & a''-b'' \end{vmatrix}$ is expressible an $m\begin{vmatrix} a & b & c \\ a' & b' & c' \\ a'' & b'' & c'' \end{vmatrix}$, then the value of m, is

A. -1

B. 0

C. 1

D. 2

Answer: B

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28. If $a \neq b$, then the system of equation $ax + by + bz = 0$ $bx + ay + bz = 0$ and $bx + by + az = 0$ will have a non-trivial solution, if

A. $a+b=0$

B. $a+2b=0$

C. $2a+b=0$

D. $a+4b=0$

Answer: B

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29. 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

A. $a+b+c=0$

B. $x=\dfrac{1}{3}(a+b+c)$

C. $x = \frac{1}{2}(a + b + c)$

D. $x = a + b + c$

Answer: B

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30. Show that $ax + by + r = 0, by + cz + p = 0 and cz + ax + q = 0$ are perpendicular to $x - y, y - z and z - x$ planes, respectively.

A. -1

B. 0

C. 1

D. 2

Answer: A

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31. Consider the function f(x) = $\begin{vmatrix} a^2+x & ab & ac \\ ab & b^2+x & bc \\ ac & bc & c^2+x \end{vmatrix}$

In which of the following interval f(x) is strictly increasing

A. x^2

B. $(a^2+x)(b^2+x)(c^2+x)$

C. $\frac{1}{x}$

D. none of these

Answer: A

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32. The equation $\begin{vmatrix} x-a & x-b & x-c \\ x-b & x-a & x-c \\ x-c & x-b & x-a \end{vmatrix} = 0$ (a,b,c are different) is satisfied by (A) $x = (a+b+c0$ (B) $x = \frac{1}{3}(a+b+c)$ (C) $x = 0$ (D) none of these

A. $x = 0$

B. $x = a$

C. $x = \frac{1}{3}(a + b + c)$

D. $x = a + b + c$

Answer: C

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33. 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, which of the following is correct ?

A. $Det(A) = 0$

B. $Det(A) \in (-\infty, 0)$

C. $Det(A) \in [2, 4]$

D. $Det(A) \in [-2, \infty)$

Answer: C

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34. If a, b, c are non-zero real number such that $\begin{vmatrix} bc & ca & ab \\ ca & ab & bc \\ ab & bc & ca \end{vmatrix} = 0,$ then

A. $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$

B. $\frac{1}{a} - \frac{1}{b} - \frac{1}{c} = 0$

C. $\frac{1}{b} + \frac{1}{c} - \frac{1}{a} = 0$

D. $\frac{1}{b} - \frac{1}{c} - \frac{1}{a} = 0$

Answer: A

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35. The value of the determinant $\begin{vmatrix} ka & k^2 + a^2 & 1 \\ kb & k^2 + b^2 & 1 \\ kc & k^2 + c^2 & 1 \end{vmatrix}$ is

A. $k(a + b)(b + c)(c + a)$

B. $kabc(a^2 + b^2 + c^2)$

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

D. $k(a+b-c)(b+c-a)(c+a-b)$

Answer: C

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36. The system of simulataneous equations

$kx+2y-z=1$

$(k-1)y-2z=2$

$(k+2)z=3$

have a unique solution if k equals

A. -2

B. -1

C. 0

D. 1

Answer: B

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37. The value of the determinant $\begin{vmatrix} 1 & \omega^3 & \omega^5 \\ \omega^3 & 1 & \omega^4 \\ \omega^5 & \omega^4 & 1 \end{vmatrix}$, where ω is an imaginary cube root of unity, is

A. $(1-\omega)^2$

B. 3

C. -3

D. none of these

Answer: B

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38. If a, b, c are non-zero real number such that $\begin{vmatrix} bc & ca & ab \\ ca & ab & bc \\ ab & bc & ca \end{vmatrix} = 0,$ then

A. $\frac{1}{a} + \frac{1}{b\omega} + \frac{1}{c\omega^2} = 0$

B. $\frac{1}{a} + \frac{1}{b\omega^2} + \frac{1}{c\omega} = 0$

C. $\frac{1}{a\omega} + \frac{1}{b\omega^2} + \frac{1}{c} = 0$

D. $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$

Answer: D

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39. If the system of equations

$x + ay + az = 0$

$bx + y + bz = 0$

$cx + cy + z = 0$

where a, b and c are non-zero non-unity, has a non-trivial solution, then value of $\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c}$ is

A. 0

B. 1

C. -1

D. $\frac{abc}{a^2+b^2+c^2}$

Answer: C

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40. The determinant $D = \begin{vmatrix} \cos(\alpha+\beta) & -\sin(\alpha+\beta) & \cos 2\beta \\ \sin\alpha & \cos\alpha & \sin\beta \\ -\cos\alpha & \sin\alpha & \cos\beta \end{vmatrix}$ is independent of :-

A. α

B. β

C. α and β

D. neither α nor β

Answer: A

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41. If ω is a cube root of unity, then Root of polynomial is

$$\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix}$$

A. 1

B. ω

C. ω^2

D. 0

Answer: D

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42. If $\Delta_1 = \begin{vmatrix} x & b & b \\ a & x & b \\ a & a & x \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$ are the given determinants then

A. $\Delta_1 = 3(\Delta_2)^2$

B. $\frac{d}{dx}(\Delta_1) = 3\Delta_2$

C. $\frac{d}{dx}(\Delta_1) = 3\Delta_2^2$

D. $\Delta_1 = 3(\Delta_2)^{3/2}$

Answer: B

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43. If y= sin px and y_n is the nth derivative of y, then

$\begin{vmatrix} y & y_1 & y_2 \\ y_3 & y_4 & y_5 \\ y_6 & y_7 & y_8 \end{vmatrix}$ is

A. m^9

B. m^2

C. m^3

D. none of these

Answer: D

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

A. 0

B. 1

C. -1

D. 2

Answer: D

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45. Using properties of determinants, show that

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

A. $(x+p)(x+q)(x-p-q)$

B. $(x-p)(x-q)(x+p+q)$

C. $(x-p)(x-q)(x-p-q)$

D. $(x+p)(x+q)(x+p+q)$

Answer: B

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46. The factors of $\begin{vmatrix} x & a & b \\ a & x & b \\ a & b & x \end{vmatrix}$, are

A. $x-a, x-b, \text{ and } x+a+b$

B. $x+a, x+b \text{ and } x+a+b$

C. $x+a, x+b \text{ and } x-a-b$

D. $x-a, x-b \text{ and } x-a-b$

Answer: A

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47. Let $\omega = -\frac{1}{2} + i\frac{\sqrt{3}}{2}$. Then the value of the determinant $|1111 - 1 - \omega^2\omega^2 1\omega^2\omega^4|$ is 3ω b. $3\omega(\omega - 1)$ c. $3\omega^2$ d. $3\omega(1 - \omega)$

A. 3ω

B. $3\omega(\omega - 1)$

C. $3\omega^2$

D. $3\omega(1 - \omega)$

Answer: D

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48. If $a + b + c = 0,$ one root of $|a - xcbcb - xabac - x| = 0$ is $x = 1$ b. $x = 2$ c. $x = a^2 + b^2 + c^2$ d. $x = 0$

A. $x = 1$

B. $x = 2$

C. $x = a^2 + b^2 + c^2$

D. $x = 0$

Answer: D

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49. suppose $D = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ and $D^r = \begin{vmatrix} a_1 + pb_1 & b_1 + qc_1 & c_1 + ra_1 \\ a_2 + pb_2 & b_2 + qc_2 & c_2 + ra_2 \\ a_3 + pb_3 & b_3 + qc_3 & c_3 + ra_3 \end{vmatrix}$. Then

A. $D' = D$

B. $D' = D(1 - pqr)$

C. $D' = D(1 + p + q + r)$

D. $D' = D(1 + pqr)$

Answer: A

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50. A and B are two non-zero square matrices such that AB = O`. Then,

A. both A and B are singular

B. either of them is singular

C. neither matrix is singular

D. none of these

Answer: A

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51. The roots of the equation $\begin{vmatrix} x-1 & 1 & 1 \\ 1 & x-1 & 1 \\ 1 & 1 & x-1 \end{vmatrix} = 0$ are

A. 1, 2

B. $-1, 2$

C. $1, \ -2$

D. $-1, \ -2$

Answer: B

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52. From the matrix equation AB=AC, we conclude B=C provided.

A. A is singular

B. A is non-singular

C. A is symmetric

D. A is square

Answer: B

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53. If $A = \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}, B = \begin{vmatrix} 1 & bc & a \\ 1 & ca & b \\ 1 & ab & c \end{vmatrix}$, then

A. $\Delta_1 + \Delta_2 = 0$

B. $\Delta_1 + 2\Delta_2 = 0$

C. $\Delta_1 = \Delta_2$

D. $\Delta_1 = 2\Delta_2$

Answer: A

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54. The value of $\begin{vmatrix} 11 & 12 & 13 \\ 12 & 13 & 14 \\ 13 & 14 & 15 \end{vmatrix}$, is

A. 1

B. 0

C. -1

D. 67

Answer: B

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55. $\begin{vmatrix} x & 4 & y+z \\ y & 4 & z+x \\ z & 4 & x+y \end{vmatrix}$ is equal to:

A. 4

B. $x+y+z$

C. xyz

D. 0

Answer: B

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56. If $f(x)=\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix}$, then

A. a

B. b

C. 0

D. 1

Answer: C

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57. Let a, b, c be the real numbers. The following system of equations in $x, y, andz$

$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{a^2}=1, \frac{x^2}{a^2}-\frac{y^2}{b^2}+\frac{z^2}{a^2}=1, -\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{a^2}=1$ has

a. no solution b. unique solution c. infinitely many solutions d. finitely many solutions

A. no solution

B. unique solution

C. infinitely many solution

D. finitely many solutions

Answer: B

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58. $A, \ B$ are two matrices such that AB and $A+B$ are both defined; show that $A, \ B$ are square matrices of the same order.

A. A and B are two matrices not necessarily of same order

B. A and B are square matrices of same order

C. number of column of A = number of rows of B

D. none of these

Answer: B

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59. If ω is an imaginary cube root of unity, then the value of $\begin{vmatrix} a & b\omega^2 & a\omega \\ b\omega & c & b\omega^2 \\ c\omega^2 & a\omega & c \end{vmatrix}$, is

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

B. $a^2b - b^2c$

C. 0

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

Answer: C

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60. If α, β are non - real numbers satifying $x^3 - 1 = 0$ then the value of

$\begin{vmatrix} \lambda+1 & \alpha & \beta \\ \alpha & \lambda+\beta & 1 \\ \beta & 1 & \lambda+\alpha \end{vmatrix}$ is equal to

A. 0

B. λ^3

C. $\lambda^3 + 1$

D. $\lambda^3 - 1$

Answer: B

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61. The value of the determinant $\begin{vmatrix} -1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{vmatrix}$ is equal to

A. -4

B. 0

C. 1

D. 4

Answer: D

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62. In a third order determinant, each element of the first column consists of sum oftwo terms, each element of the second column consists of sum of three terms and each element of the third column consits of sum of four terms, Then it can be decomposed into four terms,.Then it can be decomposed into n determinants, where n has value

A. 1

B. 9

C. 16

D. 24

Answer: D

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63. A root of the equation $\begin{vmatrix} 3-x & -6 & 3 \\ -6 & 3-x & 3 \\ 3 & 3 & -6-x \end{vmatrix} = 0$

A. 6

B. 3

C. 0

D. none of these

Answer: C

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64. For positive numbers x, y and z, the numerical value of the determinant $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix}$ is

A. 0

B. log x log y log z

C. 1

D. 8

Answer: D

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65. Calculate the value of the determinant $\begin{vmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 \\ 1 & 3 & 6 & 10 \\ 1 & 4 & 10 & 20 \end{vmatrix}$

A. 0

B. -1

C. 2

D. 10

Answer: C

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66. if $\Delta = \begin{vmatrix} 3 & 4 & 5 & x \\ 4 & 5 & 6 & y \\ 5 & 6 & 7 & z \\ x & y & z & 0 \end{vmatrix} = 0$ then

A. $(y - 2z + 3x)^2$

B. $(x - 2y + z)^2$

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

D. $x^2 + y^2 + z^2 - zy - yz - zx$

Answer: B

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

$$\begin{vmatrix} 1 & 1 & 1 \\ 1+\sin A & 1+\sin B & \sin C \\ \sin A+\sin^2 A & \sin B+\sin^2 B & \sin C+\sin^2 C \end{vmatrix} = 0$$ then the triangle must be

A. isosceles

B. equilateral

C. right angled isosceles

D. none of these

Answer: A

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68. If a,b,and c are the side of a triangle and A,B and C are the angles opposite to a,b,and c respectively, then

$\Delta = \begin{vmatrix} a^2 & b\sin A & C\sin A \\ b\sin A & 1 & \cos A \\ C\sin A & \cos A & 1 \end{vmatrix}$ is independent of

A. $\sin A \sin B \sin C$

B. abc

C. 1

D. 0

Answer: D

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69. If [ ] denotes the greatest integer less than or equal to the real number under consideration, and $-1 \leq x < 0, \ \leq y < 1, 1 \leq z < 2,$ then find the value of the following determinant: $|[x] + 1[y][z][x][y] + 1[z][x][y][z] + 1|$

A. 2

B. 6

C. 4

D. none of these

Answer: C

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70. The coefficicent of x in $f(x) = \begin{vmatrix} x & 1+\sin x & \cos x \\ 1 & \log(1+x) & 2 \\ x^2 & 1+x^2 & 0 \end{vmatrix}$ where $-1 < x \leq 1,$ is

A. 0

B. 1

C. -2

D. cannot be determined

Answer: C

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71. The determinant $\begin{vmatrix} \cos C & \tan A & 0 \\ \sin B & 0 & -\tan A \\ 0 & \sin B & \cos C \end{vmatrix}$

has the value, where A, B, C are angled of a triangle

A. 0

B. 1

C. $\sin A \sin B$

D. $\cos A \cos B \cos C$

Answer: A

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72. Using the factor theorem it is found that $a+b, b+candc+a$ are three factors of the determinant $|-2aa+ba+cb+a-2++ac+b-2c|$. The other factor in the value of the determinant is (a) 4 (b) 2 (c_ $a+b+c$ (d) none of these

A. 4

B. 2

C. $a + b + c$

D. none of these

Answer: A

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73. The value of $\begin{vmatrix} a & a^2 - bc & 1 \\ b & b^2 - ca & 1 \\ c & c^2 - ab & 1 \end{vmatrix}$, is

A. 1

B. -1

C. 0

D. $-abc$

Answer: C

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74. Find the number of real root of the equation $|0x - ax - bx + a0x - cx + bx + c0| = 0, a \neq b \neq c and b(a + c) > ac$

A. $x = 0$

B. $x = c$

C. $x = b$

D. $x = a$

Answer: A

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75. The repeated factor of the determinant

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

A. $x - z$

B. $x - y$

C. $y - z$

D. none of these

Answer: A

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76. The value of the determinant

$$\Delta = \begin{vmatrix} \frac{1-a_1^3b_1^3}{1-a_1b_1} & \frac{1-a_1^3b_2^3}{1-a_1b_2} & \frac{1-a_1^3b_3^3}{1-a_1b_3} \\ \frac{1-a_2^3b_1^3}{1-a_2b_1} & \frac{1-a_2^3b_2^3}{1-a_2b_2} & \frac{1-a_2^3b_3^3}{1-a_2b_3} \\ \frac{1-a_3^3b_1^3}{1-a_3b_1} & \frac{1-a_3^3b_2^3}{1-a_3b_2} & \frac{1-a_3^3b_3^3}{1-a_3b_3} \end{vmatrix}, \text{ is}$$

A. 0

B. dependent only on a_1, a_2, a_3

C. dependent only b_1, b_2, b_3

D. dependent on $a_1, a_2, a_3b_1, b_2, b_3$

Answer: D

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77. The determinant

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

is equal to zero, if

A. b, c, d are in A.P

B. b, c, d are in G.P

C. b, c, d are in H.P

D. α is a root of $ax^3 - cx - d = 0$

Answer: B

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78. $\Delta = \begin{vmatrix} 1/a & 1 & bc \\ 1/b & 1 & ca \\ 1/c & 1 & ab \end{vmatrix} =$

A. 0

B. abc

C. $\frac{1}{abc}$

D. none of these

Answer: A

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79. If $\begin{vmatrix} 1+ax & 1+bx & 1+bx \\ 1+a_1x & 1+b_1x & 1+c_1x \\ 1+a_2x & 1+b_2x & 1+c_2x \end{vmatrix} = A_0 + A_1x + A_2x^2 + A_3x^3$, then A_1 is equal to

A. abc

B. 0

C. 1

D. none of these

Answer: B

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80. If $abc \neq 0$ then $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$ is

A. abc

B. $abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$

C. 0

D. $1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}$

Answer: B

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81. If $1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}=0$, then

$\Delta = \begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$ is equal to

A. 0

B. abc

C. $-abc$

D. none of these

Answer: A

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82. If a, b and c are all different from zero and

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

A. abc

B. $\frac{1}{abc}$

C. $-a-b-c$

D. -1

Answer: D

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83. In a ΔABC, a, b, c are sides and A, B, C are angles opposite to them, then the value of the determinant

$$\begin{vmatrix} a^2 & b\sin A & c\sin A \\ b\sin A & 1 & \cos A \\ c\sin A & \cos A & 1 \end{vmatrix}$$, is

A. 0

B. 1

C. 2

D. 3

Answer: A

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84. If $\begin{vmatrix} -12 & 0 & \lambda \\ 0 & 2 & -1 \\ 2 & 1 & 15 \end{vmatrix} = -360$, then the value of λ is

A. -1

B. -2

C. -3

D. 4

Answer: C

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85. If $a_i, i = 1, 2, \ldots\ldots, 9$ are perfect odd squares, then $\begin{vmatrix} a_1 & a_2 & a_3 \\ a_4 & a_5 & a_6 \\ a_7 & a_8 & a_9 \end{vmatrix}$ is always a multiple of

A. 4

B. 7

C. 16

D. 5

Answer: A

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86. If maximum and minimum values of the determinant

$$\begin{vmatrix} 1+\sin^2 x & \cos^2 x & \sin 2x \\ \sin^2 x & 1+\cos^2 x & \sin 2x \\ \sin^2 x & \cos^2 x & 1+\sin 2x \end{vmatrix}$$

are α and β, then

A. $\alpha + \beta^{99} = 4$

B. $\alpha^3 - \beta^{17} = 26$

C. $\alpha^{2n} - \beta^{2n}$ is always even integer for $n \in N$

D. a triangle can be constructed having its sides as α, β and $\alpha - \beta$

Answer: A::B::C

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87. If [x] denote the greatest integer less than or equal to x then in order that the set of equations $2x - 2y = 4, 7x - 3y = 2, [3\pi[x - [e]y = [4a]$ may be consistent then 'a' should lie in

A. $[3, 7/2)$

B. $(3, 7/3)$

C. $(3, 7/3]$

D. none of these

Answer: A

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88. If $a, b > 0$ and $\Delta(x) = \begin{vmatrix} x & a & a \\ b & x & a \\ b & b & x \end{vmatrix}$, then

A. $\Delta(x)$ is increasing on $\left(-\sqrt{ab}, \sqrt{ab}\right)$

B. $\Delta(x)$ is decreasing on $(\sqrt{ab}, \infty)$

C. $\Delta(x)$ has a local manimum at $x = \sqrt{ab}$

D. none of these

Answer: C

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89. If $f(x) = ax^2 + bx + c, a, b, c\varepsilon R$ and the equation $f(x) - x = 0$ has imaginary roots α and β and p and q be the roots of equation $f\left(f(x) - x = 0, then \begin{vmatrix} 2 & \alpha & q \\ \beta & 0 & \alpha \\ p & \beta & 1 \end{vmatrix}\right.$ is (A) purely real (B) purely imaginary (C) 0 (D) none of these

A. 0

B. purely real

C. purely imaginary

D. none of these

Answer: B

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90. Let

$g(x)\left|f(x+c)\,f(x+2c)\,f(x+3c)\,f(c)\,f(2c)\,f(3c)\,f'(c)\,f'(2c)\,f'(3c)\right|,$

where c is constant, then find $\left(\lim\right)_{x \to 0} \frac{g(x)}{x}$

A. 0

B. 1

C. -1

D. none of these

Answer: A

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91. If $a^2 + b^2 + c^2 = -2 and f(x) =$

$\left|1 + a^2 x \left(1 + b^2\right) x \left(1 + c^2\right) x \left(1 + a^2\right) x 1 + b^2 x \left(1 + c^2\right) x \left(1 + a^2\right) x \left(1 + b^2\right) x\right.$

, then $f(x)$ is a polynomial of degree 0 b. 1 c. 2 d. 3

A. 0

B. 1

C. 2

D. 3

Answer: C

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92. The coefficicent of x in $f(x) = \begin{vmatrix} x & 1 + \sin x & \cos x \\ 1 & \log(1 + x) & 2 \\ x^2 & 1 + x^2 & 0 \end{vmatrix}$ where $-1 < x \leq 1,$ is

A. Δ_2^3

B. Δ_2^2

C. $D \leq ta_2^4$

D. none of these

Answer: A

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Chapter Test

1. STATEMENT-1: The lines $a_1x + b_1y + c_1 = 0a_2x + b_2y + c_2 = 0, a_3x + b_3y + c_2 = 0$ are concurrent if $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0.$

STATEMENT-2: The area of the triangle formed by three concurrent lines is always zero.

A. more than two solutions

B. one trivial and one non-trivial solutions

C. no solution

D. only trivial solution $(0, 0, 0)$

Answer: A

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2. If D = $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for $x \neq 0, y \neq 0$ then D is

A. x but not y

B. y but not x

C. neither x nor y

D. both x and y

Answer: D

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3. Use properties of determinants to solve for x:

$$\begin{vmatrix} x+a & b & c \\ c & x+b & a \\ a & b & x+c \end{vmatrix} = 0 \text{ and } x = 0$$

A. $a+b+c$

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

C. $0, a+b+c$

D. $0, \ -(a+b+c)$

Answer: D

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4. $\begin{vmatrix} \sin^2 x & \cos^2 x & 1 \\ \cos^2 x & \sin^2 x & 1 \\ -10 & 12 & 2 \end{vmatrix} =$

A. 0

B. $12\cos^2 x - 10\sin^2 x$

C. $12\sin^2 x - 10\cos^2 x - 2$

D. $10 \sin 2x$

Answer: A

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5. The system of linear equations

$x + y + z = 2$

$2x + y - z = 3$

$3x + 2y + kz = 4$

has a unique solution, if

A. $k \neq 0$

B. $-1 < k < 1$

C. $-2 < k < 2$

D. $k = 0$

Answer: A

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6. The roots of the equation

$$\begin{vmatrix} 3x^2 & x^2 + x\cos\theta + \cos^2\theta & x^2 + x\sin\theta + \sin^2\theta \\ x^2 + x\cos\theta + \cos^2\theta & 3\cos^2\theta & 1 + \frac{\sin 2\theta}{2} \\ x^2 + x\sin\theta + \sin^2\theta & 1 + \frac{\sin 2\theta}{2} & 3\sin^2\theta \end{vmatrix} = 0$$

A. $\sin\theta, \cos\theta$

B. $\sin^2\theta, \cos^2\theta$

C. $\sin\theta, \cos^2\theta$

D. $\sin^2\theta, \cos\theta$

Answer: A

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7. $\begin{vmatrix} bc & bc' + b'c & b'c' \\ ca & ca' + c'a & c'a' \\ ab & ab' + a'b & a'b' \end{vmatrix}$ is equal to

A. $(ab - a'b')(bc - b'c')(ca - c'a')$

B. $(ab + a'b')(bc + b'c')(ca + c'a')$

C. $(ab' - a'b)(bc' - b'c)(ca' - c'a)$

D. $(ab' + a'b)(bc' + b'c)(ca' + c'a)$

Answer: C

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8. If α, β, γ are the cube roots of 8 , then $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix} =$

A. 0

B. 1

C. 8

D. 2

Answer: A

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9. One root of the equation $\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} = 0 is (A) 8/3 (B)$ 2/3(C)1/3 (D)16/3`

A. $8/3$

B. $2/3$

C. $1/3$

D. $\dfrac{16}{3}$

Answer: B

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10. If a,b and c are non- zero real number then prove that

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

A. abc

B. $a^2b^2c^2$

C. $ab + bc + ca$

D. 0

Answer: D

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11. If x, y , z are in A.P., then the value of the det (A) is , where

$$A = \begin{bmatrix} 4 & 5 & 6 & x \\ 5 & 6 & 7 & y \\ 6 & 7 & 8 & z \\ x & y & z & 0 \end{bmatrix}$$

A. 0

B. 1

C. 2

D. none of these

Answer: A

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12. The value of $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix}$, is

A. 6 abc

B. $a+b+c$

C. 4 abc

D. abc

Answer: C

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13. If a, b, c are non-zero real numbers and if the system of equations $(a-1)x = y+z$, $(b-1)y = z+x$, $(c-1)z = x+y$ has a non-trivial solution, then prove that $ab+bc+ca = ab \cdot$

A. $a+b+c$

B. abc

C. 1

D. none of these

Answer: B

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14. If $a \neq 6, b, c$ satisfy $\begin{vmatrix} a & 2b & 2c \\ 3 & b & c \\ 4 & a & b \end{vmatrix} = 0$,then abc =

A. $a+b+c$

B. 0

C. b^3

D. $ab+bc$

Answer: C

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15. The value of $\Delta = \begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$, is

A. 8

B. `-8'

C. 400

D. 1

Answer: B

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16. Prove: $|aa + ba + 2ba + 2baa + ba + ba + 2ba| = 9(a + b)b^2$

A. $9a^2(a + b)$

B. $9b^2(a + b)$

C. $a^2(a+b)$

D. $b^2(a+b)$

Answer: B

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17. If all the elements in a square matrix A of order 3 are equal to 1 or - 1, then $|A|$, is

A. an odd number

B. an even number

C. an imaginary number

D. a real number

Answer: B

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18. Sum of real roots of the euation $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0$ is

A. $-1, \ -2$

B. $-1, 2$

C. $1, \ -2$

D. $1, 2$

Answer: B

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19. If $f(x) = \begin{vmatrix} \sin x & \cos x & \tan x \\ x^3 & x^2 & x \\ 2x & 1 & x \end{vmatrix}$, then $\lim_{x \to 0} \frac{f(x)}{x^2} =$

A. 3

B. -1

C. 0

D. 1

Answer: D

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

$$\begin{vmatrix} 1 & 1 & 1 \\ 1+\sin A & 1+\sin B & 1+\sin C \\ \sin A+\sin^2 A & \sin B+\sin^2 B & \sin C+\sin^2 C \end{vmatrix} = 0, \text{ then the triangle}$$

ABC is

A. equilateral

B. isosceles

C. any triangle

D. right angled

Answer: B

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21. If $\begin{vmatrix} x & 2 & 3 \\ 2 & 3 & x \\ 3 & x & 2 \end{vmatrix} = \begin{vmatrix} 1 & x & 4 \\ x & 4 & 1 \\ 4 & 1 & x \end{vmatrix} = \begin{vmatrix} 0 & 5 & x \\ 5 & x & 0 \\ x & 0 & 5 \end{vmatrix} = 0,$ then the value of x equals $(x \in R)$:

A. 0

B. 5

C. -5

D. none of these

Answer: C

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22. Using properties of determinants, solve for $x : |a + xa - xa - xa - xa + xa - xa - xa - xa + x| = 0$

A. $0, 2a$

B. $a, 2a$

C. $0, 3a$

D. none of these

Answer: C

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23. If $\Delta_1 = \begin{vmatrix} 7 & x & 2 \\ -5 & x+1 & 3 \\ 4 & x & 7 \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} x & 2 & 7 \\ x+1 & 3 & -5 \\ x & 7 & 4 \end{vmatrix}$, then the value of x for which $\Delta_1 + \Delta_2 = 0$, is

A. 2

B. 0

C. any number

D. none of these

Answer: D

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24. If $\Delta_1 = \begin{vmatrix} 10 & 4 & 3 \\ 17 & 7 & 4 \\ 4 & -5 & 7 \end{vmatrix}, \Delta_2 = \begin{vmatrix} 4 & x+5 & 3 \\ 7 & x+12 & 4 \\ -5 & x-1 & 7 \end{vmatrix}$ such that $\Delta_1 + \Delta_2 = 0$, then

A. $x = 5$

B. $x = 0$

C. x has no real value

D. none of these

Answer: A

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25. If $\begin{vmatrix} a & a+d & a+2d \\ a^2 & (a+d)^2 & (a+2d)^2 \\ 2a+3d & 2(a+d) & 2a+d \end{vmatrix} = 0$, then

A. $d = 0$

B. $a + d = 0$

C. $d = 0 roa + d = 0$

D. none of these

Answer: C

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26. If $\Delta_k = \begin{vmatrix} k & 1 & 5 \\ k^2 & 2n+1 & 2n+1 \\ k^3 & 3n^2 & 3n+1 \end{vmatrix}, \quad \text{then } \sum_{k=1}^{n} \Delta_k$ is equal to

A. $2\sum_{k=1}^{n} k$

B. $2\sum_{k=1}^{n} k^2$

C. $\frac{1}{2}\sum_{k=1}^{n} k^2$

D. 0

Answer: B

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27. If the system of equations

$bx + ay = c, cx + az = b, cy + bz = a$

has a unique solution, then

A. $abc = 1$

B. $abc = -2$

C. $abc \neq 0$

D. none of these

Answer: C

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28. If a, b, c are non-zeros, then the system of equations

$$(\alpha + a)x + \alpha y + \alpha z = 0$$
$$\alpha x + (\alpha + b)y + \alpha z = 0$$
$$\alpha x + \alpha y + (\alpha + c)z = 0$$

has a non-trivial solution if

A. $\alpha^{-1} = -(a^{-1} + b^{-1} + c^{-1})$

B. $\alpha^{-1} = a + b + c$

C. $\alpha + a + b + c = 1$

D. none of these

Answer: A

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29. If p^{th}, q^{th}, r^{th} terms an A.P are $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ respectively prove that

$$\Delta = \begin{vmatrix} bc & ca & ab \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix} = 0$$

A. $p + q + r$

B. $(a + b + c)$

C. 1

D. none of these

Answer: D

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30. If $A = \begin{vmatrix} a & b & c \\ x & y & z \\ p & q & r \end{vmatrix}$ and $B = \begin{vmatrix} q & -b & y \\ -p & a & -x \\ r & -c & z \end{vmatrix}$, then

A. $A = 2B$

B. $A = B$

C. $A = -B$

D. none of these

Answer: C

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