MATHS

BOOKS - MODERN PUBLICATION MATHS (KANNADA ENGLISH)

DETERMINANTS

Multiple Choice Questions Level I

1. $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then value of x is :

A. 3

B. ± 3

C. ± 6

D. 6

Answer: C

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

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

B. $3bc$

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

D. None of these

Answer: C

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3. The determinant $\begin{vmatrix} b^2-ab & b-c & -ac \\ ab-a^2 & a-b & b^2-ab \\ bc-ac & c-a & ab-a^2 \end{vmatrix}$ 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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4. $\Delta = \begin{vmatrix} Ax & x^2 & 1 \\ By & y^2 & 1 \\ Cz & z^2 & 1 \end{vmatrix}$ and $\Delta_1 = \begin{vmatrix} A & B & C \\ x & y & z \\ zy & zx & xy \end{vmatrix}$

A. $\Delta_1 = -\Delta$

B. $\Delta \neq \Delta_1$

C. $\Delta - \Delta_1 = 0$

D. None of these

Answer: C

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5. If, $x, y \in R$, then the determinant:

$$\Delta = \begin{vmatrix} \cos x & -\sin x & 1 \\ \sin x & \cos x & 1 \\ \cos(x+y) & -\sin(x+y) & 0 \end{vmatrix}$$ lies in the interval .

A. $\left[-\sqrt{2}, \sqrt{2}\right]$

B. $[-1, 1]$

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

D. $\left[-1, -\sqrt{2}\right]$

Answer: A

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6. 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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7. 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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8. If x, y, z are all different and not equal to 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 equal to

A. xyz

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

C. $-x-y-z$

D. -1

Answer: D

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9. The value of determinant $\begin{vmatrix} x & x+y & x+2y \\ x+2y & x & x+y \\ x+y & x+2y & x \end{vmatrix}$ is

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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10. There are two values of a which makes determinant , $A = \begin{vmatrix} 1 & -2 & 5 \\ 2 & a & -1 \\ 0 & 4 & 2a \end{vmatrix} = 86$, then sum of these numbers is :

A. 4

B. 5

C. -4

D. 9

Answer: C

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11. A root of the equation $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$ is

A. $f(a) = 0$

B. $f(b) = 0$

C. $f(0) = 0$

D. $f(1) = 0$

Answer: C

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12. The maximum value of $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1+\cos\theta & 1 & 1 \end{vmatrix}$ is (θ is real number) :

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

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

C. $\sqrt{2}$

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

Answer: A

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13. Let $f(t) = \begin{vmatrix} \cos t & t & 1 \\ 2\sin t & t & 2r \\ \sin t & t & t \end{vmatrix}$, then $\lim_{t \to 0} \frac{f(t)}{t^2}$ is equal to :

A. 0

B. -1

C. 2

D. 3

Answer: A

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14. The area of a triangle with vertices (-3,0),(3,0) and (0,k) is 9 sq. units . The value of k will be :

A. 9

B. 3

C. -9

D. 6

Answer: B

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15. T_p, T_q, T_r are the pth , qth and rth terms of an A.P., then $\begin{vmatrix} T_p & T_q & T_r \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$ equals :

A. 1

B. -1

C. 0

D. $p+q+r$

Answer: C

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16. The value of $\begin{vmatrix} p & 0 & 0 & 0 \\ a & q & 0 & 0 \\ b & c & r & 0 \\ d & e & f & s \end{vmatrix}$ is :

A. $p+q+r+s$

B. 1

C. $ab+cd+ef$

D. pqrs

Answer: D

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17. If ω is the cube root of unity then $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$ is

A. 0

B. 1

C. ω^2

D. ω

Answer: A

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18. The root of the equation :

$$\begin{vmatrix} a-x & b & c \\ 0 & b-x & 0 \\ 0 & b & c-x \end{vmatrix} = 0 \text{ are :}$$

A. a and b

B. b and c

C. a and c

D. a,b,c

Answer: D

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19. If $\begin{vmatrix} 1-x & 2 & 3 \\ 0 & b-x & 0 \\ 0 & b & c-x \end{vmatrix} = 0$ are :

A. 1 only

B. 0,1

C. 0 only

D. 1,-1,0

Answer: B

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20. If $a \neq b \neq c$ one value of x which satisfies thte equation :

$$\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$$ is given by :

A. x = a

B. x = b

C. x = c

D. x = 0

Answer: D

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21. If $a\mu^3 + b\mu^2 + c\mu + d$

$$\begin{vmatrix} 3\mu & \mu+1 & \mu-1 \\ \mu-3 & -2\mu & \mu+2 \\ \mu+3 & \mu-4 & 5\mu \end{vmatrix}$$ be an identity in μ , where a,b,c,d are constants , then the value of d is :

A. 5

B. -6

C. 9

D. 0

Answer: B

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22. The determinant:

$$\begin{vmatrix} xp+y & x & y \\ yp+z & y & z \\ 0 & xp+y & yp+z \end{vmatrix} = 0 \text{ if :}$$

A. x,y,z are in A.P

B. x,y,z are in G.P

C. x,y,z are in H.P

D. xy ,yz ,zx are in A.P

Answer: B

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23. The value of the determine $\begin{vmatrix} a+pd & a+qd & a+rd \\ p & q & r \\ d & d & d \end{vmatrix}$ is equal to :

A. 0

B. -1

C. 1

D. p+q+r

Answer: A

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24. If $f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$

then f (100) is equal to :

A. 0

B. 1

C. 100

D. -100

Answer: A

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25. The value of λ for which the system of equations :

$x + y + z = 6, x + 2y = 3z = 10, x + 4y + \lambda z = 12$ has a unique solution is :

A. $\lambda \neq -7$

B. $\lambda \neq 7$

C. $\lambda = 7$

D. $\lambda = -7$

Answer: C

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26. If a,b,c are non - zero real numbers and if the equations :

$(a-1)x = y+z, (b-1)y = z+x, (c-1)z = x+y$ has a non - trivial solution, ab+bc+ca equals :

A. a+b+c

B. abc

C. 1

D. None of these

Answer: B

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27. If $\alpha = \begin{vmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{vmatrix}, \beta = \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$, then

A. $\alpha = 2\beta$

B. $\beta = 2\alpha$

C. $\alpha = \beta$

D. $\alpha \neq \beta$

Answer: A

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28. A root of the equation $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$ is

A. x = a

B. one

C. two

D. x = 0

Answer: D

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29. If $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = \lambda a^2 b^2 c^2$ then the value of λ is :

A. 1

B. 2

C. 4

D. 3

Answer: C

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30. If α, β and γ are roots of the equations $x^3 + px + q = 0$ then the value of det : $\begin{bmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{bmatrix}$ is

A. p

B. q

C. $p^2 - 2q$

D. 0

Answer: D

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31. If x,y,z, are in A.P., then value of the det A. where $A = \begin{bmatrix} 4 & 5 & 6 & x \\ 5 & 6 & 7 & y \\ 6 & 7 & 8 & z \\ x & y & z & 0 \end{bmatrix}$ is :

A. 0

B. 1

C. 2

D. None of these

Answer: A

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32. Let $\Delta = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$, then Δ lies in the interval.

A. $[2, 3]$

B. $[3, 4]$

C. $[2, 4]$

D. $(2, 4)$

Answer: C

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33. The determinant : $\begin{vmatrix} \cos(\alpha+\beta) & -\sin(\alpha+\beta) & \cos 2\beta \\ \sin\alpha & \cos\alpha & \sin\beta \\ -\cos\alpha & \sin\alpha & \cos\beta \end{vmatrix} = 0$ is independent of :

A. α

B. β

C. α and β

D. None of these

Answer: A

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34. If $D = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ and $D' = \begin{vmatrix} a_1+pb_1 & b_1+qc_1 & c_1+ra_1 \\ a_2+pb_2 & b_1+qc_2 & c_2+ra_2 \\ a_3+pb_3 & b_3+qc_3 & c_3+ra_3 \end{vmatrix}$,

then :

A. $D' = D$

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

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

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

Answer: D

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35. If a, b, c are in G.P then the value of the determinant $\Delta = \begin{bmatrix} a & b & ax + by \\ b & c & bx + cy \\ ax + by & bx + cy & 0 \end{bmatrix}$ is

A. 1

B. 0

C. -1

D. None of these

Answer: B

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36. Let $\Delta = \begin{vmatrix} a & a+b & a+b+c \\ 3a & 4a+3b & 5a+4b+3c \\ 6a & 9a+6b & 11a+9b+6c \end{vmatrix}$ where $a = i, b = \omega, c = \omega^2$, then Δ is equal to

A. i

B. $-\omega^2$

C. ω

D. $-i$

Answer: A

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37. If $\alpha = \begin{vmatrix} 1 & x & yz \\ 1 & y & zx \\ 1 & z & xy \end{vmatrix}$ and $\beta = \begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix}$, then

A. $\alpha \neq \beta$

B. $\alpha = \beta$

C. $\alpha = 2\beta$

D. $\alpha = -\beta$

Answer: B

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38. The value of λ for which the following system of equations does not have a solution

$x + y + z = 6$

$4x + \lambda y - \lambda z = 0$

$3x + 2y - 4z = -8$

A. 3

B. -3

C. 0

D. 1

Answer: A

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39. Given $q^2 - pr < 0, p > 0,$ the value of :

$$\begin{vmatrix} p & q & px+qy \\ q & r & qx+ry \\ px+qy & qx+ry & 0 \end{vmatrix}$$ is :

A. 0

B. > 0

C. < 0

D. $q^2 + pr$

Answer: C

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40. If $p+q+r=0$ then $\begin{vmatrix} pa & qb & rc \\ qc & ra & pb \\ rb & pc & qa \end{vmatrix}$ is :

A. 0

B. pqr

C. abc

D. $pqr\begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix}$

Answer: D

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41. Let a_{ij} denote the element of the ith row and jth column in a 3×3 determinant $(1 \leq i \leq 3, 1 \leq j \leq 3)$ and let $a_{ij} = -a_{ji}$ for every i and j . Then the determinant has all the principal diagonal elements is :

A. 1

B. -1

C. 0

D. None of these

Answer: C

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42. If $a + b + c = 0$, one root of :

$$\begin{vmatrix} a-x & c & d \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0 \text{ is :}$$

A. $x = 1$

B. $x = 2$

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

D. x = 0

Answer: D

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43. The value of the determine : $\Delta = \begin{vmatrix} 1! & 2! & 3! \\ 2! & 3! & 4! \\ 3! & 4! & 5! \end{vmatrix}$ is :

A. $2!$

B. $3!$

C. $4!$

D. $5!$

Answer: C

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44. If $a \neq be \neq c$ such that

$$\begin{vmatrix} a^3-1 & b^3-1 & c^3-1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = 0$$ then,

A. $ab + bc + ca = 0$

B. $a + b + c = 0$

C. $abc = 1$

D. $a + b + c = 1$

Answer: C

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45. The determinant : $\begin{vmatrix} a & a+d & a+2d \\ a^2 & (a+d)^2 & (a+2d)^2 \\ 2a+3d & 2(a+b) & 2a+d \end{vmatrix} = 0$ Then

A. d = 0

B. a + d = 0

C. d = 0 or a + d = 0

D. None of these

Answer: C

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46. Using the factor theorem it is found that b + c , c + a and a + b are three factors of the determine : $\begin{vmatrix} -2a & a+b & a+c \\ b+a & -2b & b+c \\ c+a & c+b & -2c \end{vmatrix}$. The other factor in the value of the determine is :

A. 4

B. 2

C. a + b + c

D. None of these

Answer: A

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47. If the determinant $\begin{vmatrix} \cos 2x & \sin^2 x & \cos 4x \\ \sin^2 x & \cos 2x & \cos^2 x \\ \cos 4x & \cos^2 x & \cos 2x \end{vmatrix}$ is expanded in powers of $\sin x$, then the constant term in the expansion is :

A. 1

B. 2

C. -1

D. None of these

Answer: C

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48. The number of equation $2x + 3y = 8, 7x - 5y + 3 = 0, 4x - 6y + \lambda = 0$ is solvable if λ is :

A. 6

B. 8

C. -8

D. 6

Answer: B

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49. The number of solutions of the equation :

$x_2 - x_3 = 1$

$-x_1 + 2x_3 = 2$

$x_1 - 2x_2 = 3$ is :

A. zero

B. one

C. two

D. infinite

Answer: B

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50. If f(x) = tna x and A, B , C are the angles of ΔABC, then

$$\begin{vmatrix} f(A) & f(\pi/4) & f(\pi/4) \\ f(\pi/4) & f(B) & f(\pi/4) \\ f(\pi/4) & f(\pi/4) & f(C) \end{vmatrix}$$

A. 0

B. -2

C. 2

D. 1

Answer: C

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51. The value of the $\begin{vmatrix} \log_a\left(\frac{x}{y}\right) & \log_a\left(\frac{y}{z}\right) & \log_a\left(\frac{z}{x}\right) \\ \log_a^2\left(\frac{y}{z}\right) & \log_a^2\left(\frac{z}{x}\right) & \log_a^2\left(\frac{x}{y}\right) \\ \log_a^3\left(\frac{z}{x}\right) & \log_a^3\left(\frac{x}{y}\right) & \log_a^3\left(\frac{y}{z}\right) \end{vmatrix}$

A. 1

B. -1

C. 0

D. $\frac{1}{6}\log_a xyz.$

Answer: C

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52. If $\theta \in \left(0, \frac{\pi}{2}\right)$, then the value of :

$$\begin{vmatrix} (\sin\theta + \operatorname{cosec}\theta)^2 & (\sin\theta - \operatorname{cosec}\theta)^2 & 1 \\ (\cos\theta + \sec\theta)^2 & (\cos\theta - \sec\theta)^2 & 1 \\ (\tan\theta + \cot\theta)^2 & (\tan\theta - \cot\theta)^2 & 1 \end{vmatrix} =$$

A. $\sin\theta + \cos\theta + \tan\theta$

B. 1

C. 0

D. 4

Answer: C

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53. The value of $\begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$ lies in the interval :

A. (2,3)

B. (3,4)

C. (4,5)

D. (2,4)

Answer: D

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54. If $\alpha = \omega, b = \omega^2, c = i$, then the value of :

$\begin{vmatrix} a & a+2b & a+2b+3c \\ 3a & 4a+6b & 5a+7b+9c \\ 6a & 9a+12b & 11a+15b+18c \end{vmatrix}$ is :

A. ω

B. ω^2

C. 0

D. None of these

Answer: D

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

A. p

B. q

C. $p^2 - 2q$

D. None of these

Answer: D

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56. 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. 0

Answer: B

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57. 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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58. If the system of the equations :

$x - ky - z = 0, kx - y - z = 0, x + y - z = 0$ has a non - zero solution, then the possible values of k are :

A. $-1, 2$

B. 1,2

C. 0,1

D. $-1, 1$

Answer: D

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59. l,m,n are the pth , qth rth terms of a G.P. (all positive) , then $\begin{vmatrix} \log l & p & 1 \\ \log m & q & 1 \\ \log n & r & 1 \end{vmatrix}$ equals :

A. 3

B. 2

C. 1

D. zero

Answer: D

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60. If $a > 0$ and discriminant of $ax^2 + 2bx + c$ is negative, then :

$$\Delta = \begin{vmatrix} a & b & ax+b \\ b & c & bx+c \\ ax+b & bx+c & 0 \end{vmatrix} \text{ is :}$$

A. $+ve$

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

C. $-ve$

D. 0

Answer: C

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61. Let $\omega = -\frac{1}{2} + i\frac{\sqrt{3}}{2}$, then the value of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1-\omega^2 & \omega^2 \\ 1 & \omega^2 & \omega^4 \end{bmatrix}$ is

A. 3ω

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

C. $3\omega^2$

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

Answer: B

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62. If $1, \omega, \omega^2$ are cube roots of unity, then, :

$\Delta = \begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega & 1 & \omega \\ \omega^n & \omega^{2n} & 1 \end{vmatrix}$ is equal to :

A. 1

B. ω

C. ω^2

D. 0

Answer: D

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63. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $\left|A^3\right| = 125$ then $\alpha =$

A. ± 1

B. ± 2

C. ± 3

D. ± 5

Answer: C

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64. 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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65. Let a, b,c be any real numbers, Supose that there are real numbers x,y,z not all zero such that $x = cy + bz, y = az + cx$ and $z = bx + ay$. Then $a^2 + b^2 + c^2 + 2abc$ is equal to :

A. 1

B. 2

C. -1

D. 0

Answer: A

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Multiple Choice Questions Level Ii

1. If $a+b+c=0$, one root of :

$$\begin{vmatrix} a-x & c & d \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0 \text{ is :}$$

A. $x=1$

B. $x=2$

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

D. x = 0

Answer: D

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2. If $A+B+C=\pi$, then the value of

$$\begin{vmatrix} \sin(A+B+C) & \sin B & \cos C \\ -\sin B & 0 & \tan A \\ \cos(A+B) & -\tan A & 0 \end{vmatrix}$$ is equal to :

A. 0

B. 1

C. $2\sin B\tan A\cos C$

D. None of these

Answer: A

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3. The determinant :

$$\begin{vmatrix} a & b & a\alpha+b \\ b & c & b\alpha+c \\ a\alpha+b & b\alpha+c & 0 \end{vmatrix} = 0 \text{ if :}$$

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

B. a,b,c are in G.P or $(x-\alpha)$ is a factor of $ax^2+2bx+c$

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

D. α is root of the equations $ax^2+2bx+c=0$

Answer: D

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4. $D_k = \begin{vmatrix} 1 & n & n \\ 2k & n^2+n+1 & n^2+n \\ 2k-1 & n^2 & n^2+n+1 \end{vmatrix}$ and $\sum_{k=1}^{n} D_k = 56$

then n equals:

A. 4

B. 6

C. 8

D. None of these

Answer: D

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5. The parameter on which the value of the determinant

$$\begin{vmatrix} 1 & a & a^2 \\ \cos(p-d)x & \cos px & \cos(p+d)x \\ \sin(p-d)x & \sin px & \sin(p+d)x \end{vmatrix}$$

does not depend upon is

A. a

B. p

C. d

D. x

Answer: B

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6. Given a,b,c are in A.P. Then determinant :

$$\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix}$$ in its simplified form is :

A. $x^3 + 3ax + 7c$

B. 0

C. 15

D. $10x^2 + 5x + 2c$

Answer: B

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7. If $A = \begin{vmatrix} 1+\cos\alpha & 1+\sin\alpha & 1 \\ 1+\cos\beta & 1+\sin\beta & 1 \\ 1 & 1 & 1 \end{vmatrix} \neq 0$, then :

A. $\alpha = \beta$

B. $\alpha \neq \beta + n\pi$

C. $\alpha \neq \beta + \pi/2$

D. $\alpha \neq \beta - \pi/2$, n being any integer .

Answer: B

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8. If a , b, c are all different from zero and $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = 0$ then the value of $1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c}$ is :

A. abc

B. 1/abc

C. $a^{-1} + b^{-1} + c^{-1}$

D. zero

Answer: D

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9. If the system of equations : $x + 4ay + az = 0, x + 3by + bz = 0, x + 2cy + cz = 0$ has a non a non - zero solution ,then a,b,c are in :

A. A.P

B. G.P

C. H.P

D. None of these

Answer: C

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10. The value of the determinant :

$$\begin{vmatrix} 1 & 1 & 1 \\ {}^{m}C_1 & {}^{m+1}C_1 & {}^{m+2}C_1 \\ {}^{m}C_2 & {}^{m+1}C_2 & {}^{m+2}C_2 \end{vmatrix}$$ is equal to :

A. 1

B. -1

C. 0

D. None of these

Answer: A

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11. If A, B and C are the angles of a triangle and $\begin{vmatrix} 1 & 1 & 1 \\ 1+\sin A & 1+\sin B & 1+\sin C \\ \sin A+\sin^2 A & \sin B+\sin^2 B & \sin C+\sin^2 C \end{vmatrix} = 0$, then the triangle must be :

A. equilateral

B. isosceles

C. any triangle

D. rt. angled

Answer: B

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12. If, p,q,r are negative distinct real numbers , then the determinant

$\Delta = \begin{vmatrix} p & q & r \\ q & r & p \\ r & p & q \end{vmatrix}$ is :

A. < 0

B. ≤ 0

C. 0

D. > 0

Answer: D

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13. 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 : in dependent is :

A. n

B. a

C. x

D. None of these

Answer: A

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14. If α, β and γ are real numbers, then :

$$\Delta = \begin{vmatrix} 1 & \cos(\beta-\alpha) & \cos(\gamma-\alpha) \\ \cos(\alpha-\beta) & 1 & \cos(\gamma-\beta) \\ \cos(\alpha-\gamma) & \cos(\beta-\gamma) & 1 \end{vmatrix}$$ ie equal to :

A. -1

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

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

D. 0

Answer: D

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15. If $\sin 2x=1,$ then $\begin{vmatrix} 0 & \cos x & -\sin x \\ \sin x & 0 & \cos x \\ \cos x & \sin x & 0 \end{vmatrix}$ equals :

A. 1

B. 2

C. 3

D. None of these

Answer: D

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16. If $\Delta_r = \begin{vmatrix} 2r-1 & {}^mC_r & 1 \\ m^2-1 & 2^m & m+1 \\ m^2+m+1 & 2^m+1 & m+2 \end{vmatrix}$, then $\sum_{r=0}^{m} \Delta_r =$

A. 0

B. $m^2 - 1$

C. 2^m

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

Answer: A

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17. The value of θ satisfying :

$$\begin{vmatrix} \sin 3\theta & -2 & 3 \\ \cos 2\theta & 8 & -7 \\ 2 & 14 & 11 \end{vmatrix} = 0 \text{ is :}$$

A. $\frac{n\pi}{2}$

B. $n\pi + \pi/6$

C. $2n\pi + \pi/6$

D. $n\pi + (-1)^n \pi/6 \quad \text{or} \quad n\pi, n \in I.$

Answer: D

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18. Let $f(x) = \begin{vmatrix} \cos x & \sin x & \cos x \\ \cos 2x & \sin 2x & 2\cos 2x \\ \cos 3x & \sin 3x & 3\cos 3x \end{vmatrix}$ Then $f'\left(\frac{\pi}{2}\right) =$

A. 8

B. 6

C. 4

D. 2

Answer: C

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19. If the system of equations $x + ay + az = 0, bx + y + bz = 0, cx + cy + z = 0$ where a,b,c are non - zero and non - unity has a non - trivial solution, then the value of $\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c}$ is :

A. zero

B. 1

C. -1

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

Answer: C

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20. $\Delta_1 = \begin{vmatrix} x & b & a \\ a & x & b \\ a & a & x \end{vmatrix}, \Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$ 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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21. If $p+q+r=a+b+c=0$, then the value of :

$$\begin{vmatrix} pa & qb & rc \\ qc & ra & pb \\ rb & pc & qa \end{vmatrix}$$ is :

A. 0

B. $ap+bq+cr$

C. 1

D. None of these

Answer: A

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

A. abc

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

C. $bc + ca + ab$

D. 0

Answer: D

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23. If one of the roots of the equation $\begin{vmatrix} 7 & 6 & x \\ 2 & x & 2 \\ x & 3 & 7 \end{vmatrix} = 0$ is : x = - 9 , then the other two roots are :

A. (2,6)

B. (3,6)

C. (2,7)

D. (3,7)

Answer: C

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24. If a,b,c $>$ 0 and $x, y, z, \in R$ then the determinant :

$$\begin{vmatrix} (a^x + a^{-x})^2 & (a^x - a^{-x})^2 & 1 \\ (b^y + a^{-y})^2 & (b^y - b^{-y})^2 & 1 \\ (c^z + c^{-z})^2 & (c^z - c^{-z})^2 & 1 \end{vmatrix}$$ is equal to :

A. $a^z b^y c^z$

B. $a^{-x} b^{-y} c^{-z}$

C. 0

D. $a^{2x} b^{2y} c^{2z}$

Answer: C

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25. If $a^2+b^2+c^2=0$ 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 the value of k is :

A. 1

B. 2

C. 3

D. 4

Answer: D

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26. If $p\lambda^4+q\lambda^3+r\lambda^2+s\lambda+t = \begin{vmatrix} \lambda^3+3\lambda & \lambda-1 & \lambda+3 \\ \lambda+1 & 2-\lambda & \lambda-3 \\ \lambda-3 & \lambda+4 & 3\lambda \end{vmatrix}$ then

t is equal to :

A. 24

B. 23

C. 22

D. 21

Answer: D

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27. The value of the determinant :

$$\begin{vmatrix} 1 & \cos(\beta-\alpha) & \cos(\gamma-\alpha) \\ \cos(\alpha-\beta) & 1 & \cos(\gamma-\beta) \\ \cos(\alpha-\gamma) & \cos(\beta-\gamma) & 1 \end{vmatrix}$$ is :

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

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

C.

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

Answer: D

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28. The sum of two non - integral roots of $\begin{vmatrix} x & 2 & 5 \\ 3 & x & 3 \\ 5 & 4 & x \end{vmatrix} = 0$ is :

A. 5

B. -5

C. -18

D. None of these

Answer: B

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29. If $\Delta_1 = \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}, \Delta_2 = \begin{vmatrix} 1 & bc & a \\ 1 & ca & b \\ 1 & ab & c \end{vmatrix}$, 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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30. If α, β are non - real numbers satisfying $x^3 - 1 = 0$, 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. None of these

Answer: B

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31. The value of $\begin{vmatrix} 1 & 1 & 1 \\ (2^x + 2^{-x})^2 & (3^x + 3^{-x})^2 & (5^x + 5^{-x})^2 \\ (2^x - 2^{-x})^2 & (3^x - 3^{-x})^2 & (5^x - 5^{-x})^2 \end{vmatrix}$ is :

A. 0

B. 30^x

C. 30^{-x}

D. None of these

Answer: A

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32. The value of $\begin{vmatrix} i^m & i^{m+1} & i^{m+2} \\ i^{m+5} & i^{m+4} & i^{m+3} \\ i^{m+6} & i^{m+7} & i^{m+8} \end{vmatrix}$ where $i = \sqrt{-1}$, is :

A. 1 if m is a multiple of 4

B. 0 for all real m

C. $-i$ if m is multiple of 3

D. None of these

Answer: B

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33. If $\Delta_1 = \begin{vmatrix} 7 & x & 2 \\ -5 & x+1 & 3 \\ 4 & x & 7 \end{vmatrix}, \Delta_2 = \begin{vmatrix} x & 2 & 7 \\ x+1 & 3 & -5 \\ x & 7 & 4 \end{vmatrix}$, then $\Delta_1 + \Delta_2 = 0$ for :

A. x = 2

B. all real x

C. x = 0

D. None of these

Answer: B

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34. Let $\begin{vmatrix} 1+x & x & x^2 \\ x & 1+x & x^2 \\ x^2 & x & 1+x \end{vmatrix} = ax^5 + bx^4 + cx^3 + dx^2 + \lambda x + \mu$ be an

identity in x, where a,b,c,d λ, μ are independent of x. Then the value of λ is :

A. 3

B. 2

C. 4

D. None of these

Answer: A

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35. If $\Delta(x) = \begin{vmatrix} 1 & \cos x & 1-\cos x \\ 1+\sin x & \cos x & 1+\sin x-\cos x \\ \sin x & \sin x & 1 \end{vmatrix}$ then $\int_0^{\pi/2} \Delta(x)dx$ is equal to :

A. $\frac{1}{4}$

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

C. 0

D. $-\frac{1}{2}$

Answer: D

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36. If the equation $a(y+z)=x, b(z+x)=y$ and $c(x+y)=z,$ where $a \neq -1, be \neq -1, c \neq -1$, admit of non - trivial solutions , then :

$(1+a)^{-1}+(1+b)^{-1}+(1+c)^{-1}$ is

A. 2

B. 1

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

D. None of these

Answer: A

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37. If $p, q, \in r$ and $p^2 + q^2 - pq - q + 1 \leq 0 + \alpha + \beta + \gamma = 0$, then $\begin{vmatrix} 1 & \cos y & \cos \beta \\ \cos \gamma & p & \cos \alpha \\ \cos \beta & \cos \alpha & q \end{vmatrix} =$

A. 1

B. -1

C. 0

D. None of these

Answer: C

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38. The value of θ lying in $\left(0, \frac{\pi}{2}\right)$ and satisfying :

$$\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0 \text{ is :}$$

A. $\frac{3\pi}{24}$

B. $\frac{5\pi}{24}$

C. $\frac{11\pi}{24}$

D. $\frac{\pi}{24}$

Answer: C

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39. If a , b , c are unequal , what is the condition that value of the following determinant is zero ?

$$\Delta = \begin{vmatrix} a & a^2 & a^3+1 \\ b & b^2 & b^3+1 \\ c & c^2 & c^3+1 \end{vmatrix}$$

A. $1 + abc = 0$

B. $a + b + c + 1 = 0$

C. $(a - b)(b - c)(c - a) = 0$

D. None of these

Answer: A

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40. If $a^2 + b^2 + c^2 = -2$ and $f(x) = \begin{vmatrix} 1 + a^2x & (1 + b^2)x & (1 + c^2)x \\ (1 + a^2)x & 1 + b^2x & (1 + c^2)x \\ (1 + a^2)x & (1 + b^2)x & 1 + c^2x \end{vmatrix}$

then f(x) is a polynomial degree :

A. 0

B. 1

C. 2

D. 3

Answer: C

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41. The system of equations :

$ax - y - z = \alpha - 1$

$x - ay - z = \alpha - 1$

$x - y - \alpha z = \alpha - 1$

has no solution if α is :

A. either -2 or 1

B. -2

C. 1

D. not - 2

Answer: B

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42. 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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1. 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. infinite number of solutions

B. exactly 3 solutions

C. a unique solution

D. no solution

Answer: D

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2. The number of values of k for which the linear equations :

$4x + ky + 2z = 0$

$kx + 4y + z = 0$

$2x + 2y + z = 0$

possess a non - zero solution is :

A. 3

B. 2

C. 1

D. zero

Answer: B

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3. the number of value of k , for which the system of equations :

$(k + 1)x + 8y = 4k$

$kx + (k+3)y = 3k - 1$

has no solution is :

A. 1

B. 2

C. 3

D. infinite

Answer: A

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4. If $\alpha, \beta \neq 0$ and $f(n) = \alpha^n + \beta^n$ and

$$\begin{vmatrix} 3 & 1+f(1) & 1+f(2) \\ 1+f(1) & 1+f(2) & 1+f(3) \\ 1+f(2) & 1+f(3) & 1+f(4) \end{vmatrix}$$

$= k(1-\alpha)^2(1-\beta)^2(\alpha-\beta)^2$ then k is equal to

A. $\frac{1}{\alpha\beta}$

B. 1

C. -1

D. $\alpha\beta$

Answer: B

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5. The set of all values of λ for which the system of linear equation |

(2x_(1)-2x_(2)+x_(3),=lambdax_(1)),(2x_(1)-3x_(2)+2x_(3),=lambdax_(2)),(-

x(1)+2x_(2),=lambdax_(3))|`

has a non trivial solution

A. is an empty set

B. is a singleton

C. contains two elements

D. contains more than two elements .

Answer: C

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Recent Competitive Questions

1. The constant term of the polynomial $\begin{vmatrix} x+3 & x & x+2 \\ x & x+1 & x-1 \\ x+2 & 2x & 3x+1 \end{vmatrix}$ is

A. 1

B. -1

C. 2

D. 0

Answer: B

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2. If $\Delta_r = \begin{vmatrix} 2r-1 & {}^mC_r & 1 \\ m^2-1 & 2^m & m+1 \\ m^2+m+1 & 2^m+1 & m+2 \end{vmatrix}$, then $\sum_{r=0}^{m} \Delta_r =$

A. 0

B. $m^2 - 1$

C. $2^m\left(m^2 - 1\right)$

D. 2^{m-1}

Answer: A

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3. If $A = \begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$ and $B = \begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$, then $\frac{dA}{dx} =$

A. $3B + 1$

B. $3B$

C. $-3B$

D. $1-3B$

Answer: B

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4. If $P=\begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$ and $Q=\begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$ then $\frac{dQ}{dx}$ = _____

A. $3P+1$

B. $1-3P$

C. $-3P$

D. $3P$

Answer: D

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5. Consider the following statements :

(i) If any two rows or columns of a determinant are identical, then the value of the determinant is zero.

(ii) If the corresponding rows and columns of a determinant are interchanged, then the value of the determinant does not change.

(iii) If any two rows (or columns) of a determinant are interchanged , then the value of the determinant changes in sign.

Which of these are correct ?

A. (a) and (b)

B. (b) and (c)

C. (a) and (c)

D. (a),(b) and (c)

Answer: D

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6. If a, b and c are in A.P., then the value of $\begin{vmatrix} x+2 & x+3 & x+a \\ x+4 & x+5 & x+b \\ x+6 & x+7 & x+c \end{vmatrix}$ is

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

B. $9x^2+a+b+c$

C. 0

D. $a+b+c$

Answer: C

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7. If $\begin{vmatrix} 2a & x_1 & y_1 \\ 2b & x_2 & y_2 \\ 2c & x_3 & y_3 \end{vmatrix} = \frac{abc}{2} \neq 0$, then the area of the triangle whose vertices are $\left(\frac{x_1}{a}, \frac{y_1}{a}\right), \left(\frac{x_2}{b}, \frac{y_2}{b}\right)$ and $\left(\frac{x_3}{c}, \frac{y_3}{c}\right)$

A. $\frac{1}{4}abc$

B. $\frac{1}{8}abc$

C. $\frac{1}{4}$

D. $\frac{1}{8}$

Answer: B

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8. The system of linear equations :

$x + y + z = 6, x + 2y + 3z = 1$ and $x + 2y + az = 6$ has no solutions when :

A. $a = 2, b \neq 3$

B. $a = 3, b \neq 10$

C. $b = 2, a = 3$

D. $b = 3, a \neq 10$

Answer: B

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9. Evaluate $\begin{vmatrix} \cos 15^\circ, \sin 15^\circ \\ \sin 75^\circ, \cos 75^\circ \end{vmatrix}$

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

B. 0

C. 2

D. 3

Answer: B

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10. If a, b,c are in A.P., then the value of the determinant $\begin{vmatrix} x+2 & x+3 & x+2a \\ x+3 & x+4 & x+2b \\ x+4 & x+5 & x+2c \end{vmatrix}$ is :

A. 0

B. 1

C. x

D. 2x

Answer: A

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