MATHS

BOOKS - CENGAGE MATHS (ENGLISH)

DETERMINANTS

Illustration

1. find the value of $\begin{vmatrix} 1 & 2 & 4 \\ -1 & 3 & 0 \\ 4 & 1 & 0 \end{vmatrix}$

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2. Prove that the determinant $\Delta = \begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$ is independent of θ.

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3. The parameter on which the value of the determinant |{:(1,,a,,a^(2)),(cos (p-d)x ,,cos px,,cos(p+d)x),(sin (p-d)x,,sin px,,sin (p+d)x):}|$does \neg dependisa$ b. pc. dd. x`

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4. Let a, b, 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.

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5. If $a, b, c \in R,$ then find the number of real roots of the equation $= |xc - b - cxab - ax| = 0$

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6. If $x+y+z=0$ prove that $\begin{vmatrix} ax & by & cz \\ cy & az & bx \\ bz & cx & ay \end{vmatrix} = xyz\begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix}$

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

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8. The largest value of a third order determinant whose elements are equal to $1 \text{ or } 0$ is

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9. Prove that the value of the determinant

$$\begin{vmatrix} -7 & 5+3i & \frac{2}{3}-4i \\ 5-3i & 8 & 4+5i \\ \frac{2}{3}+4i & 4-5i & 9 \end{vmatrix} \text{ is real}$$

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10. Without expanding the determinants Prove that

$$\begin{vmatrix} 103 & 115 & 114 \\ 111 & 108 & 106 \\ 104 & 113 & 116 \end{vmatrix} + \begin{vmatrix} 113 & 116 & 104 \\ 108 & 106 & 111 \\ 115 & 114 & 103 \end{vmatrix} = 0$$

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11. Prove that $\begin{vmatrix} ax & by & cz \\ x^2 & y^2 & z^2 \\ 1 & 1 & 1 \end{vmatrix} = \begin{vmatrix} a & b & c \\ x & y & z \\ yz & xz & xy \end{vmatrix}$

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12. for $x, x, z > 0$ Prove that $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix} = 0$

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13. witout expanding at any stage Prove that

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

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14. consider the fourth -degree polynomial equation

$$\begin{vmatrix} a_1 + b_1x^2 & a_1x^2 + b_1 & c_1 \\ a_2 + b_2x^2 & a_2x^2 + b_2 & c_2 \\ a_3 + b_3x^2 & a_3x^2 + b_3 & c_3 \end{vmatrix} = 0$$

Without expanding the determinant find all the roots of the equation.

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15. Let $\Delta_r = \begin{vmatrix} r-1 & n & 6 \\ (r-1)^2 & 2n^2 & 4n-2 \\ (r-1)^3 & 3n^3 & 3n^2-3n \end{vmatrix}$. Show that $\sum_{r=1}^{n} \Delta_r$ is contant.

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16. Find the value of $\begin{vmatrix} 41 & 1 & 5 \\ 79 & 7 & 9 \\ 29 & 5 & 3 \end{vmatrix}$

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17. Find the value of determinant $\left|\sqrt{(13)} + \sqrt{3}2\sqrt{5}\sqrt{5}\sqrt{(15)} + \sqrt{(26)}5\sqrt{(10)}3 + \sqrt{(65)}\sqrt{(15)}5\right|$

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

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19. Using properties of determinants. Prove that $|\sin\alpha\cos\alpha\cos(\alpha+\delta)\sin\beta\cos\beta\cos(\beta+\delta)\sin\gamma\cos\gamma\cos(\gamma+\delta)| = 0$

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20. Using properties of determinants, solve the following for x:

$$\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{vmatrix} = 0$$

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21. By using properties of determinants, prove the following:

$|x+42x2x2 \times \ +42x2x2 \times \ +4| = (5x+4)(4-x)^2$

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22. prove that $\begin{bmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{bmatrix}$ = $(a+b+c)^3$

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23. if $x_i = a_i b_i C_i, i = 1, 2, 3$ are three- digit positive integer such that each x_i is a mulptiple of 19 then prove that det $\left\{\begin{matrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{matrix}\right\}$ is divisible by 19.

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24. If a, b and c are real numbers, and $\Delta = |b + +aa + bc + aa + +ca + + +a| = 0$ .Show that either $a + b + c = 0$ or $a = b = c$.

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25. Find the value of the determinant $|baabpqr111|, wherea, b, andc$ are respectively, the pth, qth, and rth terms of a harmonic progression.

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26.

if $a_1, a_2, a_3 \ldots .$ are in A.P, then find the value of the following determ

$$\begin{vmatrix} a_p + a_{p+m} + a_{p+2m} & 2a_p + 3a_{p+m} + 4a_{p+2m} & 4a_p + 9a_{p+m} + 16a_{p+} \\ a_p + a_{q+m} + a_{q+2m} & 2a_q + 3a_{q+m} + 4a_{q+2m} & 4a_q + 9a_{q+m} + 16a_{q+} \\ a_r + a_{r+m} + a_{r+2m} & 2a_r + 3a_{r+m} + 4a_{r+2m} & 4a_r + 9a_{r+m} + 16a_{r+} \end{vmatrix}$$

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27. Prove that $\begin{vmatrix} 1 & \beta\gamma + \alpha\delta & \beta^2\gamma^2 + \alpha^2\delta^2 \\ 1 & \gamma\alpha + \beta\delta & \gamma^2\alpha^2 + \beta^2\delta^2 \\ 1 & \alpha\beta + \gamma\delta & \alpha^2\beta^2 + \gamma^2\delta^2 \end{vmatrix} = 0$

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28. Prove that

$|a, b+c, a^2, b, c+a, b^2, c, a+b, c^2| = -(a+b+c) \times (a-b)(b-c)(c-$

a)

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29. Prove that

$$\left|x^2x^2-(y-z)^2yzy^2y^2-(z-x)^2zxz^2z^2-(x-y)^2xy\right| = (x-y)(y-z)$$

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30. If a,b,c are all distinct and $\begin{vmatrix} a & a^3 & a^4-1 \\ b & b^3 & b^4-1 \\ c & c^3 & c^4-1 \end{vmatrix}$ =0, show that abc(ab+bc+ac) = a+b+c

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31. Prove that $\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & bc & c^2+1 \end{vmatrix} = 1+a^2+b^2+c^2$

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32. prove that $\begin{vmatrix} (b+c)^2 & bc & ac \\ ba & (c+a)^2 & cb \\ ca & cb & (a+b)^2 \end{vmatrix}$

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

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33. Let a,b,c be real numbers with $a^2+b^2+c^2=1$. Show that the equation $\begin{vmatrix} ax-by-c & bx+ay & cx+a \\ bx+ay & -ax+by-c & cy+b \\ cx+a & cy+b & -ax-by+c \end{vmatrix} = 0$ represents a straight line.

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34. If $a^2+b^2+c^2=1$, then prove that

$\begin{vmatrix} a^2+(b^2+c^2)\cos\theta & ab(1-\cos\theta) & ac(1-\cos\theta) \\ ba(1-\cos\theta) & b^2(c^2+a^2)\cos\theta & bc(1-\cos\theta) \\ ca(1-\cos\theta) & cb(1-\cos\theta) & c^2+(a^2+b^2)\cos\theta \end{vmatrix}$

independent of a,b,c?

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35. Find the area of a triangle whose vertices are $A(3, 2), B(11, 8) and C(8, 12)$.

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36. If the lines $a_1x + b_1y + 1 = 0,\ a_2x + b_2y + 1 = 0\ and\ a_3x + b_3y + 1 = 0$ are concurrent, show that the points $(a_1, b_1),\ (a_2, b_2) and\ (a_3, b_3)$ are collinear.

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37. The number of values of a for which the lines $2x + y - 1 = 0$, $ax + 3y - 3 = 0,$ and $3x + 2y - 2 = 0$ are concurrent is (a).0 (b) 1 (c) 2 (d) infinite

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38. If the lines $ax+y+1=0, x+by+1=0 and x+y+c=0(a, b, c$ being distinct and different from $1)$ are concurrent, then prove that $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}=1.$

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39. Find the value of λ if $2x^2+7xy+3y^2+8x+14y+\lambda=0$ represents a pair of straight lines.

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40. show that the determinant

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

is always non- negative.

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41. Factorize the following

$|3a+b+ca^3+b^3+c^3a+b+ca^2+b^2+c^2a^4+b^4+c^4a^2+b^2+c^2a^3+$

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42. prove that $\begin{vmatrix}(a-x)^2 & (a-y)^2 & (a-z)^2 \\ (b-x)^2 & (b-y)^2 & (b-z)^2 \\ (c-x)^2 & (c-y)^2 & (c-z)^2\end{vmatrix}$ $\begin{vmatrix}(1+ax)^2 & (1+bx)^2 & (1+cx)^2 \\ (1+ay)^2 & (1+by)^2 & (1+cy)^2 \\ (1+az)^2 & (1+bx)^2 & (1+cz)^2\end{vmatrix}$

$=2(b-c)(c-a)(a-b)\times(y-z)(z-x)(x-y)$

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

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

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44. If $\begin{vmatrix} 1 & x & x^2 \\ x & x^2 & 1 \\ x^2 & 1 & x \end{vmatrix} = 3,$ then find the value of $\begin{vmatrix} x^3-1 & 0 & x-x^4 \\ 0 & x-x^4 & x^3-1 \\ x-x^4 & x^3-1 & 0 \end{vmatrix}$

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45. Show that $\begin{vmatrix} bc-a^2 & ca-b^2 & ab-c^2 \\ ca-b^2 & ab-c^2 & bc-a^2 \\ ab-c^2 & bc-a^2 & ca-b^2 \end{vmatrix}$ = $\begin{vmatrix} a^2 & c^2 & 2ca-b^2 \\ 2ab-c^2 & b^2 & a^2 \\ b^2 & 2ac-a^2 & c^2 \end{vmatrix}$.

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46. Let $= \begin{vmatrix} \cos x & \sin x & \cos x \\ \cos 2x & \sin 2x & 2\cos 2x \\ \cos 3x & \sin 3x & 3\cos 3x \end{vmatrix}$ then find the values of f(0) and f'$(\pi/2)$.

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47. If $f(x) = \left| x^{\cap}!2\cos x \frac{\cos(n\pi)}{2} 4\sin x \frac{\sin(n\pi)}{2} 8 \right|$ then find the value of $\frac{d^n}{dx^n}([f(x)])_{x=0} n \dot{\in} z.$

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

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49. Let α be a repeated root of a quadratic equation $f(x) = 0 and A(x), B(x), C(x)$ be polynomials of degrees 3, 4, and 5, respectively, then show that

$|A(x)B(x)C(x)A(\alpha)B(\alpha)C(\alpha)A'(\alpha)B'(\alpha)C'(\alpha)|$ is divisible by $f(x)$, where prime ($'$) denotes the derivatives.

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50. if $\Delta(x) = \begin{vmatrix} a_1 + x & b_1 + x & c_1 + x \\ a_2 + x & b_2 + x & c_2 + x \\ a_3 + x & b_3 + x & c_3 + x \end{vmatrix}$ then show that $\Delta(x) = 0$ and that $\Delta(x) = \Delta(0) + sx.$ where s denotes the sum of all the cofactors of all the elements in $\Delta(0)$

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51. If $\Delta(x) = \begin{vmatrix} 1 & x^2 & x^2 \\ 6 & 4x & 3 \\ 9 & x & -7 \end{vmatrix}$ then find the value of $\int_0^1 \Delta(x)dx$ without expanding $\Delta(x)$.

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52. Find the value of $a \, and \, b$ if the system of equation $a^2x - by = a^2 - b \, and \, bx - b^2y = 2 + 4b$ (i) posses unique solution (ii) infinite solutions

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53. If a system of three linear equations $x + 4ay + a = 0, x + 3by + b = 0, \text{ and } x + 2cy + c = 0$ is consistent, then prove that a, b, c are in H.P.

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54. Solve by Cramers rule $x + y + z = 6 \quad x - y + z = 2 \quad 3x + 2y - 4z = -5$

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55. For what values of p and q the system of equations $2x + py + 6z = 8, x + 2y + qz = 5, x + y + 3z = 4$ has i no solution ii a unique solution iii in finitely many solutions.

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56. If $2ax - 2y + 3z = 0, x + ay + 2z = 0, and, 2x + az = 0$ have a nontrivial solution, find the value of $a \cdot$

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57. For what values of k, the following system of equations possesses a nontrival solution over the set of rationals: $x + ky + 3z = 0, 3x + ky - 2z = 0, 2x + 3y - 4z = 0.$ Also find the solution for this value of $k \cdot$

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Example

1. Prove that: $\begin{vmatrix} -2a & a+b & a+c \\ b+a & -2b & b+c \\ c+a & c+b & -2c \end{vmatrix} = 4(a+b)(b+c)(c+a)$

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

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

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3. Prove that

$|ax - by - czay + bxcx + azay + bxby - cz - axbz + cycx + azbz + cycz$

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4. If $f(x)$ is a polynomial of degree < 3, prove that

$$|1af(a)/(x-a)1bf(b)/(x-b)1cf(c)/(x-c)| \div \left|1aa^2 1 \hat{} 21 \hat{} 2\right| = \frac{}{(x}$$

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5. 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 $\triangle = 0$

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6. Find the value of $\begin{vmatrix} \cos\left(\frac{2\pi}{63}\right) & \cos\left(\frac{3\pi}{70}\right) & \cos\left(\frac{4\pi}{77}\right) \\ \cos\left(\frac{\pi}{72}\right) & \cos\left(\frac{2\pi}{80}\right) & \cos\left(\frac{3\pi}{88}\right) \\ 1 & \cos\left(\frac{\pi}{90}\right) & \cos\left(\frac{2\pi}{99}\right) \end{vmatrix}$

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

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8. if $x_1^2 + 2y_1^2 + 3z_1^2 = x_2^2 + 2y_2^2 + 3z_2^2 = x_3^2 + 2y_3^2 + 3z_3^2 = 2$ and $x_2x_3 + 2y_2y_3 + 3z_2z_3 = x_3x_1 + 2y_3y_1 + 3z_3z_1 = x_1x_2 + 2y_1y_2 + 3z_1z_2 =$

Then find the value of $\begin{vmatrix} x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \\ x_3 & y_3 & z_3 \end{vmatrix}$

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9. Let α_1, α_2 and β_1, β_2 be the roots of the equation $ax^2 + bx + c = 0$ and $px^2 + qx + r = 0$ respectively. If the system of equations $\alpha_1 y + \alpha_2 z = 0$ and $\beta_1 y + \beta_2 z = 0$ has a non trivial solution then prove that $\frac{b^2}{q^2} = \frac{ac}{pr}$

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10. If $bc+qr=ca+rp=ab+pq=-1$ and $(abc, pqr \neq 0)$ then $\begin{vmatrix} ap & a & p \\ bq & b & q \\ cr & c & r \end{vmatrix}$ is (A) 1 (B) 2 (C) 0 (D) 3

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Concept Application Exercise 12 1

1. Evaluate $\begin{vmatrix} \cos\alpha\cos\beta & \cos\alpha\sin\beta & -\sin\alpha \\ -\sin\beta & \cos\beta & 0 \\ \sin\alpha\cos\beta & \sin\alpha\sin\beta & \cos\alpha \end{vmatrix}$

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2. If A,B,C are the angles of a non right angled triangle ABC. Then find the value of: $\begin{vmatrix} \tan A & 1 & 1 \\ 1 & \tan B & 1 \\ 1 & 1 & \tan C \end{vmatrix}$

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3. If $e^{i\theta} = \cos\theta + is\int h\eta,$ find the value of $\left|1e^{i\pi/3}e^{i\pi/4}e^{-i\pi/3}1e^{i2\pi/3}e^{-i\pi/4}e^{-i2\pi/3}1\right|$

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

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5. If α, β, γ are the roots of $ax^3 + bx^2 + cx + d = 0$ and $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix} = 0, \alpha \ne \beta \ne \gamma$ then find the equation whose roots are $\alpha + \beta - \gamma, \beta + \gamma - \alpha,$ and $\gamma + \alpha - \beta.$

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6. A triangle has vertices $A_i(x_i, y_i)$ for i= 1,2,3,. If the orthocenter of triangle is (0,0) then prove that

$$\begin{vmatrix} x_2 - x_3 & y_2 - y_3 & y_1(y_2 - y_3) + x_1(x_2 - x_3) \\ x_3 - x_1 & y_3 - y_1 & y_2(y_3 - y_1) + x_2(x_3 - x_1) \\ x_1 - x_2 & y_1 - y_2 & y_3(y_1 - y_2) + x_3(x_1 - x_2) \end{vmatrix} = 0$$

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7. if $\omega \neq 1$ is cube root of unity and x+y+z $\neq$ 0 then

$$\begin{vmatrix} \frac{x}{1+\omega} & \frac{y}{\omega+\omega^2} & \frac{z}{\omega^2+1} \\ \frac{y}{\omega+\omega^2} & \frac{z}{\omega^2+1} & \frac{x}{1+\omega} \\ \frac{z}{\omega^2+1} & \frac{x}{1+\omega} & \frac{y}{\omega+\omega^2} \end{vmatrix}$$ =0 if

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Concept Application Exercise 12 2

1. Prove that the value of determinant $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix} = 0$

where ω is complex cube root of unity .

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2. Prove that $\begin{vmatrix} a & a^2 & bc \\ b & b^2 & ac \\ c & c^2 & ab \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix}$

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3. $\text{if } \Delta = \begin{vmatrix} abc & b^2c & c^2b \\ abc & c^2a & ca^2 \\ abc & a^2b & b^2a \end{vmatrix} = 0, (a, b, c \in R \text{ and } \text{ are all}$ different and non- zero) the prove that $a + b + c = 0$

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4. if $a_r = (\cos 2r\pi + I \sin 2r\pi)^{1/9}$ then prove that

$|(a_1, , a_2, , a_3), a_4, , a_5, , a_6), (a_7, , a_8, , a_9) :\} \mid = 0$

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5. Given $A = \begin{vmatrix} a & b & 2c \\ d & e & 2f \\ l & m & 2n \end{vmatrix}, B = \begin{vmatrix} f & 2d & e \\ 2n & 4l & 2m \\ c & 2a & b \end{vmatrix}$, then the value of B/A is __________.

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Concept Application Exercise 12 3

1. Prove that the value of the following determinant is zero:
$$\begin{vmatrix} a_1 & la_1 + mb_1 & b_1 \\ a_2 & la_2 + mb_2 & b_2 \\ a_3 & la_3 + mb_3 & b_3 \end{vmatrix}$$

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2. using properties of determinants evaluate
$$\begin{vmatrix} 18 & 40 & 89 \\ 40 & 89 & 198 \\ 89 & 198 & 440 \end{vmatrix}$$

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3. Prove: $\begin{vmatrix} b+c & a-b & a \\ c+a & b-c & b \\ a+b & c-a & c \end{vmatrix} = 3abc - a^3 - b^3 - c^3$

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4. Show that

$|11 + p1 + p + q23 + 2p1 + 3p + 2q36 + 3p106p + 3q| = 1.$

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5. Solve the equation $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$ where $a+b+c \neq 0.$

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6. Show that:

$|3a - a + b - a + c - b + a3b - b + c - c + a - c + b3c| = 3(a + b + c)($

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7. Using properties of determinants Prove that

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

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8. Solve: $\begin{vmatrix} x^2-1 & x^2+2x+1 & 2x^2+3x+1 \\ 2x^2+x-1 & 2x^2+5x-3 & 2x^2+4x-3 \\ 6x^2-x-2 & 6x^2-7x+2 & 12x^2-5x-2 \end{vmatrix} = 0.$

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9. Show that

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

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10. Show that if $x_1, x_2, x_3 \neq 0$

$$\begin{vmatrix} x_1 + a_1b_1 & a_1b_2 & a_1b_3 \\ a_2b_1 & x_2 + a_2b_2 & a_2b_3 \\ a_3b_1 & a_3b_2 & x_3 + a_3b_3 \end{vmatrix}$$

$$= x_1x_2x_3\left(1 + \frac{a_1b_1}{x_1} + \frac{a_2b_2}{x_2} + \frac{a_3b_3}{x_3}\right)$$

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11. If $A, BandC$ are the angels of a triangle, show that

$| - 1 + \cos B \cos C + \cos B \cos B \cos C + \cos A - 1 + \cos A \cos A - 1 + \text{co}$

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12. If $\begin{vmatrix} a^2 & b^2 & c^2 \\ (a+1)^2 & (b+1)^2 & (c+1)^2 \\ (a-1)^2 & (b-1)^2 & (c-1)^2 \end{vmatrix} = k(a-b)(b-c)(c-a)$ then the value of k is a. 4 b. -2 c.-4 d. 2

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13. Prove that $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ bc + a^2 & ac + b^2 & ab + c^2 \end{vmatrix}$

$= 2(a - b)(b - c)(c - a)$

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14. Evaluate $\begin{vmatrix} .^x C_1 & .^x C_2 & .^x C_3 \\ .^y C_1 & .^y C_2 & .^y C_3 \\ .^x C_1 & .^z C_2 & .^z C_3 \end{vmatrix}$

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15. 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 $\cdot$

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16. Prove that

$|1 + a11111 + b11111 + c11111 + d| = abcd\left(a + \frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}\right).$

Hence find the value of the determinant if a, b, c, d are the roots of the equation $px^4 + qx^3 + rx^2 + sx + t = 0$.

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17. Prove that $\begin{vmatrix} 1 & ab & \frac{1}{a} + \frac{1}{b} \\ 1 & bc & \frac{1}{b} + \frac{1}{c} \\ 1 & ca & \frac{1}{c} + \frac{1}{a} \end{vmatrix} = 0$

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

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19. Show that $\begin{vmatrix} a & b - c & c + b \\ a + c & b & c - a \\ a - b & b + a & c \end{vmatrix} = (a + b + c)\left(a^2 + b^2 + c^2\right)$

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Concept Application Exercise 12 4

1. If x_1, x_2, x_3 as well as y_1, y_2, y_3 are in G.P. with same common ratio, then prove that the points $(x_1, y_1), (x_2, y_2), and(x_3, y_3)$ are collinear.

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2. If lines $px + qy + r = 0, qx + ry + p = 0$ and $rx + py + q = 0$ are concurrent, then prove that $p + q + r = 0(where, p, q, r$ are distinct).

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3. if

$(x_1 - x_2)^2 + (y_1 - y_2)^2 = a^2, (x_2 - x_3)^2 + (y_2 - y_3)^2 = b^2(x_3 - x_1)^2 + ($

where a,b,c are positive then prove that

$$4\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = (a + b + c)(b + c - a)(c + a - b)(a + b - c)$$

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4. it is known that the equation of hyperbola and that of its pair of asymptotes differ by constant . If equation of hyperbola is $x^2 + 4xy + 3y^2 - 4x + 2y + 1 = 0$ then find the equation of its pair of asymptoes.

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Concept Application Exercise 12 5

1. Prove that

$|(b+x)(c+x)(v+x)(a+x)(a+x)(b+x)(b+y)(c+y)(c+x)(a+t)$

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2. $\Delta = \begin{vmatrix} 1+a^2+a^4 & 1+ab+a^2b^2 & 1+ac+a^2c^2 \\ 1+ab+a^2b^2 & 1+b^2+b^4 & 1+bc+b^2c^2 \\ 1+ac+a^2c^2 & 1+bc+b^2c^2 & 1+c^2c^4 \end{vmatrix}$ is equal to

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3. Prove that $|2\alpha+\beta+\gamma+\delta\alpha\beta+\gamma\delta\alpha+\beta+\gamma+\delta 2(\alpha+\beta)(\gamma+\delta)\alpha\beta(\gamma+\delta)+\gamma\delta(\alpha$

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4. For all values of $A, B, CandP, Q, R$ show that $|\cos(A-P)\cos(A-Q)\cos(A-R)\cos(B-P)\cos(B-Q)\cos(B-R)\cos$

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

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6. Express $\Delta = \begin{vmatrix} 2bc - a^2 & c^2 & b^2 \\ c^2 & 2ca - b^2 & a^2 \\ b^2 & a^2 & 2ab - c^2 \end{vmatrix}$ as square of a determinant of hence evaluate if.

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Concept Application Exercise 12 6

1. Let $f(x) = \begin{vmatrix} \cos(x + x^2) & \sin(x + x^2) & -\cos(x + x^2) \\ \sin(x - x^2) & \cos(x - x^2) & \sin(x - x^2) \\ \sin 2x & 0 & \sin(2x^2) \end{vmatrix}$. Find the value of $f'(0)$.

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2. If $f(x), g(x) and h(x)$ are three polynomial 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.

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3. If $g(x)=\dfrac{f(x)}{(x-a)(x-b)(x-c)}$, where f(x) is a polynomial of degree <3, then prove that

$$\frac{dg(x)}{dx}=\begin{vmatrix}1 & a & f(a)(x-a)^{-2}\\ 1 & b & f(b)(x-b)^{-2}\\ 1 & c & f(c)(x-c)^{-2}\end{vmatrix}\div\begin{vmatrix}a^2 & a & 1\\ b^2 & b & 1\\ c^2 & c & 1\end{vmatrix}.$$

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4. If $f(x)=\begin{vmatrix}\cos(x+\alpha) & \cos(x+\beta) & \cos(x+\gamma)\\ \sin(x+\alpha) & \sin(x+\beta) & \sin(x+\gamma)\\ \sin(\beta-\gamma) & \sin(\gamma-\alpha) & \sin(\alpha-\beta)\end{vmatrix}$ and $f(0)=2$ theb find the value of $\Sigma_{r=1}^{30}|f(r)|$.

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5. $f(x)=\begin{vmatrix}\cos x & x & 1\\ 2\sin x & x^2 & 2x\\ \tan x & x & 1\end{vmatrix}$ then find the value of $\lim_{x\to 0}\dfrac{f(x)}{x}$

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Concept Application Exercise 12 7

1. Find the following system of equations is consistent, $(a+1)^3x+(a+2)^3y=(a+3)^3$ $(a+1)x+(a+2)y=a+3$ +=1, then find the value of $a\cdot$

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2. Solve the system of the equations: $ax+by+cz=d$, $a^2x+b^2y+c^2z=d^2, a^3x+b^3y+c^3z=d^3$.

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3. consider the system of equations : ltbr. $3x-y+4z=3$

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

$6x+5y+\lambda z=-3$

Prove that system of equation has at least one solution for all real values of λ.also prove that infinite solutions of the system of equations satisfy $\frac{7x-4}{-5}=\frac{7y+9}{13}=z$

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4. If the equation $2x+3y+1=0, 3x+y-2=0,$ and $ax+2y-b=0$ are consistent, then prove that $a-b=2.$

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5. if x,y and z are not all zero and connected by the equations $a_1x+b_1y+c_1z=0, a_zx+b_2y+c_2z=0$ and $(p_1+\lambda q_1)x+(p_2+\lambda q_2)y+(p_3+\lambda q_3)z=0$ show that

$$\lambda=-\begin{vmatrix}a_1 & b_1 & c_1\\ a_2 & b_2 & c_2\\ p_1 & p_2 & p_3\end{vmatrix}\div\begin{vmatrix}a_1 & b_1 & c_1\\ a_2 & b_2 & c_2\\ q_1 & q_2 & q_3\end{vmatrix}$$

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Single Correct Answer Type

1. if $\theta \in R$ then maximum value of $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1 & 1 & 1+\cos\theta \end{vmatrix}$ is

A. $\sqrt{3}/2)$

B. $1/2$

C. $1/\sqrt{2}$

D. None of these

Answer: B

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2. If p + q + r = a + b + c = 0, then the determinant $\begin{vmatrix} pa & qb & rc \\ qc & ra & pb \\ rb & pc & qa \end{vmatrix}$ equals

A. 0

B. $pa + qb + rc$

C. 1

D. none of these

Answer: A

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3. If α, β, γ are the roots of $px^3 + qx^2 + r = 0$, then the value of the determinant $\begin{vmatrix} \alpha\beta & \beta\gamma & \gamma\alpha \\ \beta\gamma & \gamma\alpha & \alpha\beta \\ \gamma\alpha & \alpha\beta & \beta\gamma \end{vmatrix}$ is p b. q c. 0 d. r

A. p

B. q

C. 0

D. r

Answer: C

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4. If $f(x) = a = bx + cx^2 and \alpha, \beta, \gamma$ are the roots of the equation $x^3 = 1, then|abcbcacab|$ is equal to $f(\alpha) + f(\beta) + f(\gamma)$ $f(\alpha)f(\beta) + f(\beta)f(\gamma) + f(\gamma)f(\alpha)$ $f(\alpha)f(\beta)f(\gamma) - f(\alpha)f(\beta)f(\gamma)$

A. $f(\alpha) + f(\beta) + f(\gamma)$

B. $f(\alpha)f(\beta) + f(\beta)f(\gamma) + f(\gamma)f(\alpha)$

C. $f(\alpha)f(\beta)f(\gamma)$

D. $-f(\alpha)f(\beta)f(\gamma)$

Answer: D

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5. If [] denotes the greatest integer less than or equal to the ral number under consideration, and $-1 \leq x < 0, 0 \leq y < 1, 1 \leq a < 2,$ then the value of the determinant $|[x] + 1[y][z][x][y] + 1[z][x][y][z] + 1|$ is $[x]$ b. $[y]$ c. $[z]$ d. none of these

A. $[x]$

B. $[y]$

C. $[z]$

D. none of these

Answer: C

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6. if a=cos 0 + i sin 0,=cos 20 -i sin 20, c= cos3 0 + I sin 3 0 and if $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = 0$ then

A. $0 = 2k\pi, k \in Z$

B. $0 = (2k+1)\pi k \in Z$

C. $0 = (4k+1)\pi k \in Z$

D. none of these

Answer: A

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7. 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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8. 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 is

A. 1

B. 0

C. -1

D. 2

Answer: C

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9. If a determinant of order 3×3 is formed by using the numbers 1 or -1 then minimum value of determinant is :

A. -2

B. -4

C. 0

D. -8

Answer: B

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10. If A, B, C are angles of a triangles, then the value of $e^{2iA}e^{-iC}e^{-iB}e^{-iC}e^{2iB}e^{-iA}e^{-iB}e^{-iA}e^{2iC}$ is 1 b. -1 c. -2 d. -4

A. 1

B. -1

C. -2

D. -4

Answer: D

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11. If a, b, c are different, then the value of $\begin{vmatrix} 0 & x^2-a & x^3-b \\ x^2+a & 0 & x^2+c \\ x^4+b & x-c & 0 \end{vmatrix}$ is a.

b b. c c. b d. 0

A. a

B. c

C. b

D. 0

Answer: D

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12. if the value of the determinant $\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix}$ is positivie then

$(a, b, c < 0)$

A. $abc > 1$

B. $abc > -8$

C. $abc > -8$

D. $abc > -2$

Answer: B

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13. if $A_1, B_1, C_1 \ldots\ldots$ are respectively the cofactors of the elements $a_1, b_1, c_1 \ldots\ldots$ of the determinant $\Delta = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}, \Delta \neq 0$ then the value of $\begin{vmatrix} B_2 & C_2 \\ B_3 & C_3 \end{vmatrix}$ is equal to

A. $a_1^2 \Delta$

B. $a_1 \Delta$

C. $a_1 \Delta^2$

D. $a_1^2 \Delta^2$

Answer: B

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14. If $a, b, c, d, e, and f$ are in G.P. then the value of $\left|a^2 d^2 x b^2 e^2 y c^2 f^2 z\right|$ depends on $x and y$ b. $x and z$ c. $y and z$ d. independent of $x, y, and z$

A. x and y

B. x and z

C. y and z

D. independent of x,y and z

Answer: D

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15. Let $x < 1$, then value of $\begin{vmatrix} x^2+2 & 2x+1 & 1 \\ 2x+1 & x+2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$ is a. none-negative b. none-positive c. negative d. positive

A. non-negative

B. non- positive

C. begative

D. positive

Answer: C

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16. The value of $\begin{vmatrix} -1 & 2 & 1 \\ 3+2\sqrt{2} & 2+2\sqrt{2} & 1 \\ 3-2\sqrt{2} & 2-2\sqrt{2} & 1 \end{vmatrix}$ is equal to

A. 0

B. $-16\sqrt{2}$

C. $-8\sqrt{2}$

D. none of these

Answer: B

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17. 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. $\sum_{i=1}^{n} D_i = 0$

C. $D_i D_j, \forall I, j$

D. None of these

Answer: B

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18. if w is a complex cube root to unity then value of

$$\Delta = \begin{vmatrix} a_1 + b_1 w & a_1 w^2 + b_1 & c_1 + b_1 \overline{w} \\ a_2 + b_2 w & a_2 w^2 + b_2 & c_2 + b_2 \overline{w} \\ a_3 + b_3 w & a_3 w^2 + b_3 & c_3 + b_3 \overline{w} \end{vmatrix}$$ is

A. 0

B. -1

C. 2

D. none of these

Answer: A

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19. 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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20. If x,y, z are in A.P., then the values of the determinant $\begin{vmatrix} a+2 & a+3 & a+2y \\ a+3 & a+4 & a+2y \\ a+4 & a+5 & a+2z \end{vmatrix}$, is

A. 1

B. 0

C. 2a

D. a

Answer: B

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21. If $a_1, a_2, a_3, \ldots\ldots.$ are in G.P. then the value of determinant $\begin{vmatrix} \log(a_n) & \log(a_{n+1}) & \log(a_{n+2}) \\ \log(a_{n+3}) & \log(a_{n+4}) & \log(a_{n+5}) \\ \log(a_{n+6}) & \log(a_{n+7}) & \log(a_{n+8}) \end{vmatrix}$ equals (A) 0 (B) 1 (C) 2 (D) 3

A. 1

B. 0

C. 2a

D. a

Answer: B

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22. Value of $|x+yzzxy+zxyyz+x|, wherex, y, z$ are nonzero real number, is equal to xyz b. $2xyz$ c. $3xyz$ d. $4xyz$

A. xyz

B. 2xyz

C. 3xyz

D. 4xyz

Answer: D

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23. Which of the following is not the root of the equation $|x-6-12-3\times\ -3-32\times\ +2|=0?\ 2\ \mathrm{b.}\ 0\ \mathrm{c.}\ 1\ \mathrm{d.}\ -3$

A. 2

B. 0

C. 1

D. -3

Answer: B

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24. The value of the determinant $\left|kak^2+a^2 1kbk^2+b^2 1kck^2+c^2 1\right|$ is $k(a+b)(b+c)(c+a)\quad kabc\left(a^2+b^{f2}+c^2\right)\quad k(a-b)(b-c)(c-a)$ $k(a+b-c)(b+c-a)(c+a-b)$

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

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

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

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

D. $x=a+b+c$

Answer: B

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26. If $f'(x) = \begin{vmatrix} mx & mx-p & mx+p \\ n & n+p & n-p \\ mx+2n & mx+2n+p & mx+2n-p \end{vmatrix}$, then $y = f(x)$ represents a. a straight line parallel to x-axis b. a straight line parallel to y-axis c. parabola d. a straight line with negative slope

A. a straight line parallet to x-axis

B. a striaght line parallel to y-axis

C. parabola

D. a striaght line with negative slope

Answer: B

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

A. 0

B. -9

C. 3

D. none of these

Answer: B

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28. If $\begin{vmatrix} x^n & x^{n+2} & x^{2n} \\ 1 & x^a & a \\ x^{n+5} & x^{a+6} & x^{2n+5} \end{vmatrix} = 0, \forall x \in R, where n \in N,$ then value of a is n b. $n-1$ c. $n+1$ d. none of these

A. n

B. n-1

C. n+1

D. none of these

Answer: C

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29. for the equation $\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = 0$

A. There are exactly two distinct roots

B. there is one pair of equation real roots

C. There are three pairs of equal roots

D. Modulus of each root is 2

Answer: C

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

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

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

A. 0

B. 1

C. 2

D. 3

Answer: C

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31. 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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32. the value of the determinant

$$\begin{vmatrix} .^n C_{r-1} & .^n C_r & (r+1)^{n+2} C_{r+1} \\ .^n C_r & .^n C_{r+1} & (r+2)^{n+2} C_{r+2} \\ .^n C_{r+1} & .^n C_{r+2} & (r+3)^{n+2} C_{r+3} \end{vmatrix}$$ is

A. $n^2 + n - 1)$

B. 0

C. $.^{n+3} C_{r+3}$

D. $.^n C_{r-1} +^n C_r +^n C_{r+1}$

Answer: B

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33. if $f(x) = \begin{vmatrix} x & a & a \\ a & x & a \\ a & a & x \end{vmatrix} = 0$ then

A. $f(x) = 0 \quad \text{and} \quad f(x) = 0$ has one common root

B. $f(x) = 0 \quad \text{and} \quad f(x) = 0$ has one common root

C. sum of roots of f(x) =0 is -3a

D. none of these

Answer: B

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34. If $x \neq y \neq z \quad \text{and} \quad \begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0,$ then xyz =

A. 1

B. 2

C. -1

D. -2

Answer: C

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35. if $x \neq 0, y \neq 0, z \neq 0$ and $\begin{vmatrix} 1+x & 1 & 1 \\ 1+y & 1+2y & 1 \\ 1+z & 1+z & 1+3z \end{vmatrix} = 0$ then $x^{-1} + y^{-1} + z^{-1}$ is equal to

A. -1

B. -2

C. -3

D. none of these

Answer: C

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36. if $a_1b_1c_1, a_2b_2c_2$ and $a_3b_3c_3$ are three-digit even natural numbers and $\Delta = \begin{vmatrix} c_1 & a_1 & b_1 \\ c_2 & a_2 & b_2 \\ c_3 & a_3 & b_3 \end{vmatrix}$ then Δ is

A. divisible by 2 but not necessarily by 4

B. divisible by 4 but not necessarily by 8

C. divisible by 8

D. none of these

Answer: A

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

A. $D' = D$

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

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

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

Answer: D

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39. The value of the determinant $\begin{vmatrix} \log_a\left(\frac{x}{y}\right) & \log_a\left(\frac{y}{z}\right) & \log_a\left(\frac{z}{x}\right) \\ \log_b\left(\frac{y}{z}\right) & \log_b\left(\frac{z}{x}\right) & \log_b\left(\frac{x}{y}\right) \\ \log_c\left(\frac{z}{x}\right) & \log_c\left(\frac{x}{y}\right) & \log_c\left(\frac{y}{z}\right) \end{vmatrix}$

A. 1

B. -1

C. 0

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

Answer: C

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40. If $a > 0, b > 0, c > 0$ are respectively the pth, qth, rth terms of a G.P.,

then the value of the determinant

$\begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix}$, is

A. 0

B. log (abc)

C. $-(p+q+r)$

D. none of these

Answer: A

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41. If $a > 0$ and discriminant of $ax^2 + 2bx + c$ is negative, then $\Delta = \begin{vmatrix} a & b & ax+b \\ b & c & bx+c \\ ax+b & bx+c & 0 \end{vmatrix}$ is

a. $+ve$

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

c. $-ve$

d. 0

A. $+ve$

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

C. $-ve$

D. 0

Answer: C

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42. 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 $-\frac{\pi}{4} \le x \le \frac{\pi}{4}$ is

A. 0

B. 2

C. 1

D. 3

Answer: C

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43. if

$$D_k = \begin{vmatrix} 1 & n & n \\ 2k & n^2+n+1 & n^2+n \\ 2k-1 & n^2 & n^2+n+1 \end{vmatrix} \text{ and } \Sigma_{k=1}^{n} D_k = 56$$

then n equals

A. 4

B. 6

C. 8

D. 7

Answer: D

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44. the value of $\Sigma_{r=2}^{n}(-2)^r \begin{vmatrix} {}^{n-2}C_{r-2} & {}^{n-2}C_{r-1} & {}^{n-2}C_r \\ -3 & 1 & 1 \\ 2 & -1 & 0 \end{vmatrix} (n > 2)$

A. $2n-1+(-1)^n$

B. $2n+1+(-1)^{n-1}$

C. $2n-3+(-1)^n$

D. none of these

Answer: A

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

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

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

D. none of these

Answer: A

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46. Roots of the equations $\begin{vmatrix} x & m & n & 1 \\ a & x & n & 1 \\ a & b & x & 1 \\ a & b & c & 1 \end{vmatrix} = 0$ are

A. independent of m and n

B. independent of a,b and c

C. depend on m,n and a,b,c

D. inedependent of m,n and a,b,c

Answer: A

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47. If x, y, z are different from zero and $\text{Delta} = \begin{vmatrix} a & b-y & c-z \\ a-x & b & c-z \\ a-x & b-y & c \end{vmatrix} = 0,$ then the value of the expression $\frac{a}{x} + \frac{b}{y} + \frac{c}{z}$ is a. 0 b. -1 c. 1 d. 2

A. 0

B. -1

C. 1

D. 2

Answer: D

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48. about to only mathematics

A. 0

B. 3

C. 6

D. 12

Answer: B

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49. In triangle ABC, if $\begin{vmatrix} 1 & 1 & 1 \\ \cot\left(\frac{A}{2}\right) & \cot\left(\frac{B}{2}\right) & \cot\left(\frac{C}{2}\right) \\ \tan\left(\frac{B}{2}\right)+\tan\left(\frac{C}{2}\right) & \tan\left(\frac{C}{2}\right)+\tan\left(\frac{A}{2}\right) & \tan\left(\frac{A}{2}\right)+\tan\left(\frac{B}{2}\right) \end{vmatrix}$ then the triangle must be (A) Equilateral (B) Isoceless (C) Right Angle (D) none of these

A. equilateral

B. isosceles

C. obtuse angled

D. none of these

Answer: B

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50. If $\begin{vmatrix} a & b-c & c+b \\ a+c & b & c-a \\ a-b & a+b & c \end{vmatrix} = 0$, then the line $ax+by+c=0$ posses through the fixed point which is

A. $(1, 2)$

B. $(1, 1)$

C. $(-2, 1)$

D. $(1, 0)$

Answer: B

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

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

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

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

D. (d) $\begin{vmatrix} ax+by & bc+cy \\ a'x+b'y & b'x+c'y \end{vmatrix}$

Answer: D

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52. Let $\vec{a}_r = x_r\hat{i} + y_r\hat{j} + z_r\hat{k}, r = 1, 2, 3$ three mutually prependicular unit vectors then the value of $\begin{vmatrix} x_1 & x_2 & x_3 \\ y_1 & y_2 & y_3 \\ z_1 & z_2 & z_3 \end{vmatrix}$ is equal to

A. zero

B. ± 1

C. ± 2

D. none of these

Answer: B

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53. Let

$$\begin{vmatrix} y^5z^6(z^3-y^3) & x^4z^6(x^3-z^3) & x^4y^5(y^3-x^3) \\ y^2z^3(y^6-z^6) & xz^3(z^6-x^6) & xy^2(x^6-y^6) \\ y^2 \hat{} (3)(z^3-y^3) & xz^3(x^3-z^3) & xy^2(y^3-x^3) \end{vmatrix} \text{ and } \Delta_2 = \begin{vmatrix} x \\ x^4 \\ x^7 \end{vmatrix}$$

.Then $\Delta_1 \Delta_2$ is equal to

A. Δ_2^6

B. Δ_2^4

C. Δ_2^3

D. Δ_2^2

Answer: C

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54. the value of the determinant

$$\begin{vmatrix} (a_1-b_1)^2 & (a_1-b_2)^2 & (a_1-b_3)^2 & (a_1-b_4)^2 \\ (a_2-b_1)^2 & (a_2-b_2)^2 & (a_2-b_3)^2 & (a_2-b_4)^2 \\ (a_3-b_1)^2 & (a_3-b_2)^2 & (a_3-b_3)^2 & (a_3-b_4)^2 \\ (a_4-b_1)^2 & (a_4-b_2)^2 & (a_4-b_3)^2 & (a_4-b_4)^2 \end{vmatrix}$$ is

A. dependant on $a_i, i = 1, 2, 3, 4$

B. dependant on $b_i, i = 1, 2, 3, 4$

C. dependant on $a_{ij}, b_i i = 1, 2, 3, 4$

D. 0

Answer: D

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55. if $\Delta(x) = \begin{vmatrix} \tan x & \tan(x+h) & \tan(x+2h) \\ \tan(x+2h) & \tan x & \tan(x+h) \\ \tan(x+h) & \tan(x+2h) & \tan x \end{vmatrix}$, then

The value of $\lim_{h \to 0} . \left(\frac{\Delta(\pi/3)}{\left(\sqrt{3}\right)h^2} \right)$ is

A. 144

B. 216

C. 64

D. 36

Answer: A

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56. Value of $\begin{vmatrix} 1+x_1 & 1+x_1x & 1+x_1x^2 \\ 1+x_2 & 1+x_2x & 1+x_2x^2 \\ 1+x_3 & 1+x_3x & 1+x_3x^2 \end{vmatrix}$ depends upon

A. x only

B. $x_1$only

C. $x_2$only

D. none of these

Answer: D

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57. If $\begin{vmatrix} a^2+\lambda^2 & ab+c\lambda & ca-b\lambda \\ ab-c\lambda & b^2+\lambda^2 & bc+a\lambda \\ ca+b\lambda & bc-a\lambda & c^2+\lambda^2 \end{vmatrix} \begin{vmatrix} \lambda & c & -b \\ -c & \lambda & a \\ b & -a & \lambda \end{vmatrix}$=$\left(1+a^2+b^2+c^2\right)^3$

, then he value of λ is 8 b. 27 c. 1 d. -1

A. 8

B. 27

C. 1

D. -1

Answer: C

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58. 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. zero

B. -16

C. 16

D. -11

Answer: D

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59. 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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60. if y= sin mx, them the value of the determinant

$\begin{vmatrix} y & y_1 & y_2 \\ y_3 & y_4 & y_5 \\ y_6 & y_7 & y_8 \end{vmatrix}$ Where $y_n = \frac{d^n y}{dx^n}$ is

A. m^9

B. m^2

C. m^3

D. 0

Answer: D

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61. Let $f(x) = \begin{vmatrix} 2\cos^2 x & \sin 2x & -\sin x \\ \sin 2x & 2\sin^2 x & \cos x \\ \sin x & -\cos x & 0 \end{vmatrix}$, then the value of $\int_0^{\pi/2} \{f(x) + f'(x)\}dx$ is

A. π

B. $\pi/2$

C. 2π

D. $3\pi/2$

Answer: A

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62. a, b, c are distinct real numbers not equal to one. If $ax+y+z=0, x+by+z=0,$ and $x+y+cz=0$ have nontrivial solution, then the value of $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}$ is equal to a.1 b. -1 c.$zero$ d. none of these

A. -1

B. 1

C. zero

D. none of these

Answer: B

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63. If the system of linear equation $x+y+z=6, x+2y+3c=14, and 2x+5y+\lambda z=\mu(\lambda, \mu R)$ has a unique solution, then

A. $\lambda \neq 8$

B. $\lambda = 8, \mu \neq 36$

C. $\lambda = 8, \mu = 36$

D. none of these

Answer: A

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64. If α, β, γ are the angles of a triangle and system of equations

$\cos(\alpha - \beta)x + \cos(\beta - \gamma)y + \cos(\gamma - \alpha)z = 0$

$\cos(\alpha + \beta)x + \cos(\beta + \gamma)y + \cos(\gamma + \alpha)z = 0$

$\sin(\alpha + \beta)x + \sin(\beta + \gamma)y + \sin(\gamma + \alpha)z = 0$ has non-trivial solutions, then triangle is necessarily a. equilateral b. isosceles c. right angled d. acute angled

A. equiliateral

B. isosoceles

C. right angled

D. acute angled

Answer: B

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65. Given $a = x/(y-z), b = y/(z-x),$ and $c = z/(x-y), where. x, y$ and z are not all zero, then the value of $ab + bc + ca$ is a.0 b. 1 c.-1 d. none of these

A. 0

B. 1

C. -1

D. none of these

Answer: C

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66. If $pqr \neq 0$ and the system of equation $(p+a)x + by + cz = 0$ $ax + (q+b)y + cz = 0$ $ac + by + (r+c)z = 0$ has nontrivial solution, then value of $\frac{a}{p} + \frac{b}{q} + \frac{c}{r}$ is -1 b. 0 c.0 d. $\neg - 2$

A. -1

B. 0

C. 1

D. 2

Answer: A

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67. The value of $|\alpha|$ for which the system of equation $\alpha x + y + z = \alpha - 1$ $x + \alpha y + z = \alpha - 1$ $x + y + \alpha z = \alpha - 1$ has no solutions, is _______.

A. either -2 or 1

B. -2

C. 1

D. not-2

Answer: B

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68. the set of equations $\lambda x - y + (\cos\theta)z = 0, 3x + y + 2z = 0$

$(\cos\theta)x + y + 2z = 0$,$0 \leq \theta < 2\pi$ has non-trivial solution (s)

A. for no value of λ and 0

B. for all values of λ and 0

C. for all values of λ and only tow values of 0

D. for only one value of λ and all values of 0

Answer: A

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69. If $c < 1$ and the system of equations $x + y - 1 = 0, 2x - y - c = 0,$ and $-bx + 3by - c = 0$ is consistent, then the possible real values of b are

A. $b \in \left(-3\frac{3}{4}\right)$

B. $b \in \left(-\frac{3}{2}, 4\right)$

C. $b \in \left(-\frac{3}{4}, 3\right)$

D. none of these

Answer: C

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70. If a, b, c are in G.P. with common ratio $r_1 and \alpha, \beta, \gamma$ are in G.P. with common ratio r_2 and equations

$ax + \alpha y + z = 0, bx + \beta y + z = 0, cx + \gamma y + z = 0$ have only zero solution, then which of the following is not true?

A. $r_1 \neq 1$

B. $r_2 \neq 1$

C. $r_1 \neq r_2$

D. none of these

Answer: D

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71. if the system of equations

$(a-t)x + by + cz = 0$

$bx + (c-t)y + az = 0$

$cx + ay + (b-t)z = 0$

has non-trivial solutions then product of all possible values of t is

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

B. $a+b+c$

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

D. 1

Answer: A

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72. Let λ and α be real. Then the numbers of intergral values λ for which the system of linear equations

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

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

$-x+(\sin\alpha)y-(\cos\alpha)z=0$ has non-trivial solutions is

A. 0

B. 1

C. 2

D. 3

Answer: D

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Multiple Correct Answers Type

1. Which of the following has / have value equal to zero ?

A. $\begin{vmatrix} 8 & 2 & 7 \\ 12 & 3 & 5 \\ 16 & 4 & 3 \end{vmatrix}$

B. $\begin{vmatrix} 1/a & a^2 & bc \\ 1/b & b^2 & ac \\ 1/c & c^2 & ab \end{vmatrix}$

C. $\begin{vmatrix} a+b & 2a+b & 3a+b \\ 2a+b & 3a+b & 4a+b \\ 4a+b & 5a+b & 6a+b \end{vmatrix}$

D. $\begin{vmatrix} 2 & 43 & 6 \\ 7 & 35 & 4 \\ 3 & 17 & 2 \end{vmatrix}$

Answer: A::B::C

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2. 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. f(300,200=f(400,200)

B. f(200,400)=f(200,600)

C. f(100,200)=f(200,200)

D. none of these

Answer: A::C

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3. if $f(0) = \begin{vmatrix} \sin 0 & \cos 0 & \sin 0 \\ \cos 0 & \sin 0 & \cos 0 \\ \cos 0 & \sin 0 & \sin 0 \end{vmatrix}$ then

A. f(0)= 0 has exactly 2 real solutions in $[0, \pi]$

B. f(0) =0 has exactly 3 real solutions in $[0, \pi]$

C. range of function $\frac{f(0)}{1 - \sin 20}$ is $[-\sqrt{2}, \sqrt{2}]$

D. range of fucntion $.\frac{f(0)}{\sin 20 - 1}$ is $[-3, 3]$ is $[-3, 3]$

Answer: A::C

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4. If $f(x)=\begin{vmatrix} a & -1 & 0 \\ ax & a & -1 \\ ax^2 & ax & a \end{vmatrix}$, then $f(2x) - f(x)$ is divisible by

1) a

2) b

3) c, d, e

4). none of these

A. x

B. a

C. $2a + 3x$

D. x^2

Answer: A::B::C

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

A. a

B. b

C. c,d,e

D. none of these

Answer: A::B::C

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6. if $\Delta = \begin{vmatrix} -x & a & b \\ b & -x & a \\ a & b & -x \end{vmatrix}$ then a factor of Δ is

A. $a+b+x$

B. $x^2-(a-b)x+a^2+b^2+ab$

C. $x^2 + (a+b)x + a^2 + b^2 - ab$

D. $a + b - x$

Answer: C::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

B. x^2

C. x^3

D. none of these

Answer: A::B

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8. $\begin{vmatrix} a & a^2 & 0 \\ 1 & 2a+b & (a+b) \\ 0 & 1 & 2a+3b \end{vmatrix}$ is divisible by

a. $a+b$

b. $a+2b$

c. $2a+3b$

d. a^2

A. $a+b$

B. $a+2b$

C. $2a+3b$

D. a^2

Answer: A

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9. the roots of the equations $\begin{vmatrix} .^x C_r & .^{n-1} C_r & .^n C_r \\ .^{x+1} C_r & .^n C_r & .^{n+1} C_r \\ .^{x+2} C_r & .^{n+1} C_r & .^{n+2} C_r \end{vmatrix} = 0$

A. $x = n$

B. $x = n + 1$

C. $x = n - 1$

D. $x = n - 2$

Answer: A::C

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10. If $f(x) = \begin{vmatrix} 3 & 3x & 3x^2 + 2a^2 \\ 3x & 3x^2 + 2a^2 & 3x^3 + 6a^2x \\ 3x^2 + 2a^2 & 3x^3 + 6a^2x & 3x^4 + 12a^2x^2 + 2a^4 \end{vmatrix}$

then

A. f'(x)=0

B. y=f(x) is a straight line parallel to x-axis

C. $\int_0^2 f(x)dx = 32a^4$

D. none of these

Answer: A::B

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11. Let $f(n) = \begin{vmatrix} n & n+1 & n+2 \\ .^n P_n & .^{n+1} P_{n+1} & .^{n+2} P_{n+2} \\ .^n C_n & .^{n+1} C_{n+1} & .^{n+2} C_{n+2} \end{vmatrix}$ where the sysmbols have their usual neanings .then f(n) is divisible by

A. $n^2 + n + 1$

B. $(n + 1)!$

C. $n!$

D. none of these

Answer: A::C

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12. the determinant $\begin{vmatrix} a & b & a\alpha+b \\ b & c & b\alpha+c \\ a\alpha+b & b\alpha+c & 0 \end{vmatrix} = 0$ is equal to zero if

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

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

C. α is a root of the equation $ax^2+bx+c=0$

D. $(x-\alpha)$ is a factor fo $ax^2+2bx+c$

Answer: B::D

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13. if $\begin{vmatrix} \sin x & \sin y & \sin z \\ \cos x & \cos y & \cos z \\ \cos^3 x & \cos^3 y & \cos^3 z \end{vmatrix} = 0$ then which of the following is / are possible ?

A. $x=y$

B. $y=z$

C. $x = z$

D. $x + y + z = \pi/2$

Answer: A::B::C::D

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14. If $\begin{vmatrix} x^2+x & x+1 & x-2 \\ 2x^2+3x-1 & 3x & 3x-3 \\ x^2+2x+3 & 2x-1 & 2x-1 \end{vmatrix} = xA + B$ then find A and B

A. $\begin{vmatrix} 1 & 1 & 1 \\ -1 & -3 & 3 \\ 4 & 0 & 0 \end{vmatrix}$

B. $\begin{vmatrix} 0 & 1 & 2 \\ 1 & -2 & 3 \\ -4 & 0 & 0 \end{vmatrix}$

C. $\begin{vmatrix} 1 & 1 & -2 \\ -3 & -2 & 3 \\ 4 & 0 & 1 \end{vmatrix}$

D. $\begin{vmatrix} 0 & 1 & -2 \\ -1 & -3 & 3 \\ 4 & 0 & 0 \end{vmatrix}$

Answer: A::D

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15. if $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ bc & ca & ab \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix}$ where a,b,c are distinct positive reals then the possible values of abc is / are

A. $\frac{1}{18}$

B. $\frac{1}{63}$

C. $\frac{1}{27}$

D. $\frac{1}{9}$

Answer: A::B

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16. $\begin{vmatrix} .^x C_r & .^x C_{r+1} & .^x C_{r+2} \\ .^y C_r & .^y C_{r+1} & .^y C_{r+2} \\ .^z C_r & .^z C_{r+1} & .^z C_{r+2} \end{vmatrix}$ is equal to

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17. If $\begin{vmatrix} \sin\theta\cos\phi & \sin\theta\sin\phi & \cos\theta \\ \cos\theta\cos\phi & \cos\theta\sin\phi & -\sin\theta \\ -\sin\theta\sin\phi & \sin\theta\cos\phi & \theta \end{vmatrix}$ then

A. Δ is independent of theta

B. Δ is independent of ϕ

C. $\Delta$is a constant

D. $\left[\frac{d\Delta}{d}(\theta)\right]_{\theta=\pi/2} = 0$

Answer: B::D

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18. If $f(\theta) = |\sin^2 A \cot A 1 \sin^2 B \cos B 1 \sin^2 C \cos C 1|$, then $tanA + tanB + c \cot A \cot B \cot C \sin^2 A + \sin^2 B + \sin^2 C$ 0

A. $\tan A + \tan B + C$

B. $\cot A \cot B \cot C$

C. $\sin^2 A + \sin^2 B + \sin^2 C$

D. 0

Answer: D

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19. if determinant $\begin{vmatrix} \cos(\theta+\phi) & -\sin(\theta+\phi) & \cos 2\phi \\ \sin\theta & \cos\theta & \sin\phi \\ -\cos\theta & \sin\theta & \cos\phi \end{vmatrix}$ is

A. non-negative

B. independent of theta

C. independent of ϕ

D. none of these

Answer: A::B

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20. If $g(x) = \begin{vmatrix} a^{-x} & e^{x \log_e a} & x^2 \\ a^{-3x} & e^{3x \log_e a} & x^4 \\ a^{-5x} & e^{5x \log_e a} & 1 \end{vmatrix}$ then

A. graphs of g(x) is symmetrical about the origin

B. gpaphs of g(x) is symmertical about the y-axis

C. $\frac{d^4 g(x)}{dx^4}\Big|_{x=0} = 0$

D. $f(x) = g(x) \times \log.\left(\frac{a-x}{a+x}\right)$ is an odd function

Answer: A::C

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21. If

$(x) = \left|\left[x^2 + 4x - 32x + 413\right]\left[2x^2 + 5x - 94x + 526\right]\left[8x^2 - 6x + 116x\right.\right.$ —

then $a = 3$ b. $b = 0$ c.$c = 0$ d. none of these

A. $a = 3$

B. $b = 0$

C. $c = 0$

D. None of these

Answer: B::C

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22. if $\begin{vmatrix} yz-x^2 & zx-y^2 & xy-z^2 \\ xz-y^2 & xy-z^2 & yz-x^2 \\ xy-z^2 & yz-x^2 & zx-y^2 \end{vmatrix} = \begin{vmatrix} r^2 & u^2 & u^2 \\ u^2 & r^2 & u^2 \\ u^2 & u^2 & r^2 \end{vmatrix}$ then

A. $r^2 = x+y+z$

B. $r^2 = x^2 = y^2 + z^2$

C. $u^2 = yz + zx + xy$

D. $u^2 = xyz$

Answer: B::C

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23. which of the following is / are true for

$$\Delta = \begin{vmatrix} a^2 & 1 & a+c \\ 0 & b^2+1 & b+c \\ 0 & b+c & c^2+1 \end{vmatrix} ?$$

A. $\Delta \geq 0$ for real values of a,b,c

B. $\Delta \leq 0$ for real values of a,b,c

C. $\Delta = \begin{vmatrix} bc-1 & 0 & 0 \\ 1 & ac & -a \\ -b & -a & ab \end{vmatrix}$

D. $\Delta = 0$ if bc =1 where a,b,c are non-zero

Answer: A::C::D

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24. The values of $k \in R$ for which the system of equations $x + ky + 3z = 0, \ kx + 2y + 2z = 0, \ 2x + 3y + 4z = 0$ admits of nontrivial solution is 2 b. $5/2$ c. 3 d. $5/4$

A. 2

B. $5/2$

C. 3

D. $5/4$

Answer: A::B

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25. The system of equations $-2x + y + z = a \quad x - 2y + z = b$ $x + y - 2z = c$ has

A. no solution if $a + b + c \neq 0$

B. unique solution if $a + b + c = 0$

C. infinite number of solutions if $a + b + c = 0$

D. None of these

Answer: A::C

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26. Let α, β and γ be the roots of the equations $x^3 + ax^2 + bx + c = 0, (a \neq 0)$. If the system of equations

$\alpha x + \beta y + \gamma z = 0$

$\beta x + \gamma y + \alpha z = 0$ and $\gamma x = \alpha y + \beta z = 0$ has non-trivial solution then

A. $a^2 = 3b$

B. $a^3 = 27c$

C. $b^3 = 27c^2$

D. $\alpha + \beta + \gamma = 0$

Answer: A::B::C

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Linked Comprehension Type

1. 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. f(x) =0 and f(x) =0 have one positive common root

B. f(x)=0 and f(x)=0 have one negative common root

C. f(x) =0 and f(x) =0 have no common root

D. None of these

Answer: D

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2. 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. f(x) has one +ve point of maxima.

B. f(x) has one -ve point of minima

C. f(x)=0 has three distinct roots

D. Local minimum value of f(x) is zero

Answer: D

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3. 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. $(-\infty, \infty)$

B. $(-\infty, 0)$

C. $(0, \infty)$

D. None of these

Answer: C

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4. Let $\Delta = \begin{vmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ac & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{vmatrix}$ and the equation $px^3+qx^2+rx+s=0$ has roots a,b,c where $a, b, c \in R^+$

if $\Delta = 27$ and $a^2+b^2+c^2=3$then

A. r^2/p^2

B. r^3/p^3

C. $-s/p$

D. none of these

Answer: B

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5. Let $\Delta = \begin{vmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ac & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{vmatrix}$ and the equation $px^3+qx^2+rx+s=0$ has roots a,b,c where $a, b, c \in R^+$

if $\Delta = 27$ and $a^2+b^2+c^2=3$then

A. $\leq 9r^2/p^2$

B. $\geq 27s^2/p^2$

C. $\leq 27s^3/p^3$

D. none of these

Answer: B

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6. Let $\Delta = \begin{vmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ac & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{vmatrix}$ and the equation $px^3+qx^2+rx+s=0$ has roots a,b,c where $a, b, c \in R^+$

if $\Delta = 27$ and $a^2+b^2+c^2 = 3$then

A. $3p+2q=0$

B. $4p+3q=0$

C. $3p+q=0$

D. none of these

Answer: C

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7. if $x > m, y > n, z > r(x, y, z > 0)$ such that $\begin{vmatrix} x & n & r \\ m & y & r \\ m & n & z \end{vmatrix} = 0$ the value of $\frac{m}{x-m} + \frac{n}{y-n} + \frac{z}{z-r}$ is

A. 1

B. -1

C. 2

D. -2

Answer: C

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8. if $x > m, y > n, z > r(x, y, z > 0)$ such that $\begin{vmatrix} x & n & r \\ m & y & r \\ m & n & z \end{vmatrix} = 0$

the value of $\frac{m}{x-m} + \frac{n}{y-n} + \frac{z}{z-r}$ is

A. -2

B. -4

C. 0

D. -1

Answer: D

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9. if $x > m, y > n, z > r(x, y, z > 0)$ such that $\begin{vmatrix} x & n & r \\ m & y & r \\ m & n & z \end{vmatrix} = 0$

the value $\frac{xyz}{(x-m)(y-n)(z-r)}$ is

A. 27

B. $\frac{8}{27}$

C. $\frac{64}{27}$

D. None of these

Answer: B

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10.

$$f(x) = \begin{vmatrix} x + c_1 & x + a & x + a \\ x + b & x + c_2 & x + a \\ x + b & x + b & x + c_3 \end{vmatrix} \text{ and } \quad g(x) = (C_1 - x)(c_3 - x)$$

Coefficient of x in f(x) is

A. $\frac{g(a) - f(b)}{b - a}$

B. $\frac{g(-a) - g(-b)}{b - a}$

C. $\frac{g(a) - g(b)}{b - a}$

D. none of these

Answer: C

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11.

$$f(x) = \begin{vmatrix} x+c_1 & x+a & x+a \\ x+b & x+c_2 & x+a \\ x+b & x+b & x+c_3 \end{vmatrix} \text{ and } g(x) = (C_1 - x)(c_3 - x)$$

Coefficient of x in f(x) is

A. $\dfrac{bg(a) - ag(b)}{(b-a)}$

B. $\dfrac{bf(a) - af(-b)}{(b-a)}$

C. $\dfrac{bf(-a) - ag(b)}{(b-a)}$

D. none of these

Answer: D

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12.

$$f(x)=\begin{vmatrix} x+c_1 & x+a & x+a \\ x+b & x+c_2 & x+a \\ x+b & x+b & x+c_3 \end{vmatrix} \text{ and } g(x)=(C_1-x)(c_3-x)$$

`Which of the following is not true ?

A. $f(-a)=g(a)$

B. $f(-a)=g(-a)$

C. $f(-b)=g(b)$

D. none of these

Answer: B

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13. Suppose $f(x)$ is a function satisfying the following conditions: $f(0)=2, f(1)=1$ f has a minimum value at $x=\frac{5}{2}$ For all $x, f'(x)=|2ax2ax-12ax+b+1+1-12(ax+b)2ax+2b+12ax+$

where a, b are some constants. Determine the constants a, b , and the function $f(x)$

A. $1/4$

B. $1/2$

C. -1

D. 3

Answer: B

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14. Suppose $f(x)$ is a function satisfying the following conditions: $f(0) = 2, f(1) = 1$ f has a minimum value at $x = \frac{5}{2}$ For all $x, f'(x) = |2ax2ax - 12ax + b + 1 + 1 - 12(ax + b)2ax + 2b + 12ax +$

where a, b are some constants. Determine the constants a, b , and the function $f(x)$

A. both roots positive

B. both roots negative

C. roots of opposite sign

D. imaginary roots

Answer: D

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15. Suppose $f(x)$ is a function satisfying the following conditions: $f(0)=2, f(1)=1$ f has a minimum value at $x=\frac{5}{2}$ For all $x, f'(x)=|2ax2ax-12ax+b+1+1-12(ax+b)2ax+2b+12ax+$ where a, b are some constants. Determine the constants a, b , and the function $f(x)$

A. $[7/16, \infty)$

B. $(-\infty, 15/16]$

C. $[3/4, \infty)$

D. none of these

Answer: A

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16. Consider the polynomial fucntion

$$f(x) = \begin{vmatrix} (1+x)^a & (1+2x)^b & 1 \\ 1 & (1+x)^a & (1+2x)^b \\ (1+2x)^b & 1 & (1+x)^a \end{vmatrix}$$ a,b being positive integers. The constant term in f(x) is

A. 2

B. 1

C. -1

D. 0

Answer: D

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17. Consider the polynomial fucntion

$$f(x) = \begin{vmatrix} (1+x)^2 & (1+2x)^b & 1 \\ 1 & (1+x)^a & (1+2x)^b \\ (1+2x)^b & 1 & (1+x)^a \end{vmatrix}$$

a,b being positive integers.

The constant term in f(x) is

A. 2^a

B. $2^a - 3 \times 2^b + 1$

C. 0

D. none of these

Answer: C

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18. Consider the polynomial fucntion

$$f(x) = \begin{vmatrix} (1+x)^2 & (1+2x)^b & 1 \\ 1 & (1+x)^a & (1+2x)^b \\ (1+2x)^b & 1 & (1+x)^a \end{vmatrix}$$

a,b being positive integers.

The constant term in f(x) is

A. All the roots of the equation f(x)=0 are positive

B. All the roots of the equation f(x)=0 are negative

C. At least one of the equation f(x)=0 is repeating one .

D. None of these

Answer: C

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19. Given that the system of equations $x = cy + bz, y = az + cx, z = bx + ay$ has nonzero solutions and and at least one of the a,b,c is a proper fraction.

$a^2 + b^2 + c^2$ is

A. > 2

B. > 3

C. < 3

D. < 2

Answer: C

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20. Given that the system of equations $x = cy + bz, y = az + cx, z = bx + ay$ has nonzero solutions and and at least one of the a,b,c is a proper fraction.

abc is

A. > -1

B. > 1

C. < 2

D. < 3

Answer: A

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Watch Video Solution

21. Given that the system of equations $x = cy + bz,\ y = az + cx,\ z = bx + ay$ has nonzero solutions and and at least one of the a,b,c is a proper fraction.

abc is

A. $x, y, z \equiv \left(1 - 2a^2\right) : \left(1 - 2b^2\right) : \left(1 - 2c^2\right)$

B. $x.\ y.\ z \equiv \frac{1}{1 - 2a^2} : \frac{1}{1 - 2b^2} : \frac{1}{1 - 2c^2}$

C. $x.\ y.\ z \equiv \frac{a}{1 - a^2} : \frac{b}{1 - b^2} : \frac{c}{1 - c^2}$

D. $x.\ y.\ z \equiv \sqrt{1 - a^2} : \sqrt{1 - b^2} : \sqrt{1 - c^2}$

Answer: D

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22. Consider the system of equations

$x + y + z = 6$

$x + 2y + 3z = 10$

$x + 2y + \lambda z = \mu$

the system has unique solution if (a) $\lambda \neq 3$ (b) $\lambda = 3, \mu = 10$ (c) $\lambda = 3, \mu \neq 10$ (d) none of these

A. $\lambda \neq 3$

B. $\lambda = 3, \mu = 10$

C. $\lambda = 3, \mu \neq 10$

D. none of these

Answer: A

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23. Consider the system of equations

$x + y + z = 6$

$x + 2y + 3z = 10$

$x + 2y + \lambda z = \mu$

the system has infinite solutions if (a) $\lambda \neq 3$ (b) $\lambda = 3, \mu = 10$ (c) $\lambda = 3, \mu \neq 10$ (d) $\lambda = 3, \mu \neq 10$

A. $\lambda \neq 3$

B. $\lambda = 3, \mu = 10$

C. $\lambda = 3, \mu \neq 10$

D. $\lambda = 3, \mu \neq 10$

Answer: B

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24. Consider the system of equations

$x + y + z = 6$

$x + 2y + 3z = 10$

$x + 2y + \lambda z = \mu$

The system has no solution if (a) $\lambda \neq 3$ (b) $\lambda = 3, \mu = 10$ (c) $\lambda = 3, \mu \neq 10$ (d) none of these

A. $\lambda \neq 3$

B. $\lambda = 3, \mu = 10$

C. $\lambda = 3, \mu \neq 10$

D. none of these

Answer: C

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Numerical Value Type

1. If $a_1, a_2, a_3, 5, 4, a_6, a_7, a_8, a_9$ are in $H.P.$ and the value of the determinant $\begin{vmatrix} a_1 & a_2 & a_3 \\ 5 & 4 & a_6 \\ a_7 & a_8 & a_9 \end{vmatrix}$ is D then the value of $21D/10$ is

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2. The sum of values of p for which the equations x+y+z=1, x+2y +4z=p and x+4y +10z $=p^2$ have a solution is _____

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3. The sum of roots of the equations

$$\begin{vmatrix} x+2 & 2x+3 & 3x+4 \\ 2x+3 & 3x+4 & 4x+5 \\ 3x+5 & 5x+8 & 10x+17 \end{vmatrix} = 0 \text{ is } \_\_\_\_$$

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4. about to only mathematics

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5. 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 the value of f(500) ______

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6. If $\begin{vmatrix} x & x+y & x+y+z \\ 2x & 3x+2y & 4x+3y+2z \\ 3x & 6x+3y & 10x+6y+3z \end{vmatrix} = 64$ then the real value of x is

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7. Let

$D_1 = |aba + bcdc + daba - b| and D_2 = |aca + cbdb + daca + b + c|$

then the value of $\left|\frac{D_1}{D_2}\right|, where b \neq 0 and ad \neq bc,$ is ____.

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8. if $a_1, a_2, a_3 \ldots\ldots, a_{12}$ are in A.P and

$\Delta_1 = \begin{vmatrix} a_1 a_5 & a_1 & a_2 \\ a_2 a_6 & a_2 & a_3 \\ a_3 a_7 & a_3 & a_4 \end{vmatrix} \Delta_2 = \begin{vmatrix} a_2 a_{10} & a_2 & a_3 \\ a_3 a_{11} & a_3 & a_4 \\ a_4 a_{12} & a_4 & a_5 \end{vmatrix}$

then $\Delta_1 : \Delta_2 =$ ______

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9. if $\left(1 + ax + bx^2\right)^4 = a_0 + a_1x + a_2x^2 + \ldots.. + a_8x^8$, where $a, b, a_0, a_1 \ldots \ldots, a_8 \in R$ such that $a_0 + a_1 + a_2 \neq 0$ and $\begin{vmatrix} a_0 & a_1 & a_2 \\ a_1 & a_2 & a_0 \\ a_2 & a_0 & a_1 \end{vmatrix} = 0$ then the value of $5.\dfrac{a}{b}$ is ____

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10. $\begin{vmatrix} 5\sqrt{\log_5 3} & 5\sqrt{\log_5 3} & 5\sqrt{\log_5 3} \\ 3^{-\log_{1/3} 4} & (0.1)^{\log_{0.01} 4} & 7^{\log_7 3} \\ 7 & 3 & 5 \end{vmatrix}$ is equal to ____

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11. Let a+b+c =s and $\begin{vmatrix} s+c & a & b \\ c & s+a & b \\ c & a & s+b \end{vmatrix} = 432$ then the value of s is ____

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12. Let $a, b, c, \in R$ not all are equal and $\Delta_1 = \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

$\Delta_2 = \begin{vmatrix} a+2b & b+3c & c+4a \\ b+2c & c+3a & a+4b \\ c+2a & a+3b & b+4c \end{vmatrix}$ then $\frac{\Delta_2}{\Delta_1} = \_\_\_\_$

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13. Three distinct points $P(3u^2, 2u^3)$; $Q(3v^2, 2v^3)$ and $R(3w^2, 2w^3)$ are collinear then

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14. if $\Delta_r = \begin{vmatrix} r & 612 & 915 \\ 101r^2 & 2r & 3r \\ r & \frac{1}{r} & \frac{1}{r^2} \end{vmatrix}$ then the value of

$\lim_{n \to \infty} \cdot \frac{1}{n^3} \left(\Sigma_{r=1}^{n} \Delta_r \right.$ is $\_\_\_\_$

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15. if x=31,y=32 and z=33 then the value of

$$\begin{vmatrix}(x^2+1)^2 & (xy+1)^2 & (xz+1)^2 \\ (xy+1)^2 & (y^2+1)^2 & (yz+1)^2 \\ (xz+1)^2 & (yz+1)^2 & (z^2+1)^2\end{vmatrix} \text{ is } \_\_\_\_$$

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16. Let α, β, γ are the real roots of the equation $x^3 + ax^2 + bx + c = 0(a, b, c \in Randa \neq 0)$. If the system of equations $(\in u, v, andw)$ given by $\alpha u + \beta v + \gamma w = 0$ $\beta u + \gamma v + \alpha w = 0$ $\gamma u + \alpha v + \beta w = 0$ has non-trivial solutions then the value of a^2 / b is ________.

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17. The value of $|\alpha|$ for which the system of equation

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

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

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

has no solution , is _____

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18. Number of values of θ lying I [0,100π] for which the system of equations (sin 3θ) x-y+z=0, (cos 2θ) x+4y +3z=0, 2x+ 7y+7z =0 has non-trivial solution is _____

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19. Let ω be the complex number $\cos\left(\frac{2\pi}{3}\right) + i\sin\left(\frac{2\pi}{3}\right)$. Then the number of distinct complex cos numbers z satisfying $\Delta = \begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix} = 0$ is

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20. The total number of distinct $x \in R$ for which $\begin{vmatrix} x & x^2 & 1+x^3 \\ 2x & 4x^2 & 1+8x^3 \\ 3x & 9x^2 & 1+27x^3 \end{vmatrix} = 10$ is (A) 0 (B) 1 (C) 2 (D) 3

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21. For a real number α, if the system $\left[1\alpha\alpha^2\alpha 1\alpha\alpha^2\alpha 1\right][xyz] = [1-11]$ of linear equations, has infinitely many solutions, then $1+\alpha+\alpha^2 =$

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22. Let P be a matrix of order 3 x 3 such that all the entries in P are from the set {-1,0,1} . Then, the maximum possible value of the determinant of P is _____

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Archives Single Correct Answer Type

1. 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: 3

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2. 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. no solution

B. infinite number of solutions

C. exactly three solutions.

D. a unique solution

Answer: 1

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3. The number of values of k for which the linear equations $4x + ky + 2z = 0$ $kx + 4y + z = 0$ $2x + 2y + z = 0$ posses a non-zero solution is : (1) 3 (2) 2 (3) 1 (4) zero

A. zero

B. 3

C. 2

D. 1

Answer: 3

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4. The number of values of k for which the system of equations:

$kx + (3k+2)y = 4k$

$(3k-1)x + (9k+1)y = 4(k+1)$ has no solution, are

A. infinite

B. 1

C. 2

D. 3

Answer: 2

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5. If $\alpha, \beta \neq 0$, and $f(n) = \alpha^n + \beta^n$ and $|31 + f(1)1 + f(2)1 + f(1)1 + f(2)1 + f(3)1 + f(2)1 + f(3)1 + f(4)| =$

, then K is equal to (1) $\alpha\beta$ (2) $\frac{1}{\alpha\beta}$ (3) 1 (4) -1

A. $\alpha\beta$

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

C. 1

D. -1

Answer: 3

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6. The set of the 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. is an empty set

B. is a singleton set

C. contains two elements

D. contains more than two elements

Answer: 3

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7. The system of linear equations $x + \lambda y - z = 0$ $\lambda x - y - z = 0$ $x + y - \lambda z = 0$ has a non-trivial solution for : (1) infinitely many values of λ . (2) exactly one value of λ . (3) exactly two values of λ . (4) exactly three values of λ .

A. Exactly one value of λ

B. Exactly two values of λ

C. Exactly three values of λ

D. Infinitely many values of λ

Answer: 3

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8. If S is the set of distinct values of $'b$ for which the following system of linear equations $x+y+z=1\,x+ay+z=1\,ax+by+z=0$ has no solution, then S is : a finite set containing two or more elements (2) a singleton an empty set (4) an infinite set

A. a singleton set

B. an empty set

C. an infinite set

D. a finite set containing two or more elements

Answer: 1

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9. Let ω be a complex number such that $2\omega + 1 = z$ where $z = \sqrt{-3.}$

$$If\begin{vmatrix} 1 & 1 & 1 \\ -\omega^2 & -1 & \omega^2 \\ 1 & \omega^2 & \omega^7 \end{vmatrix} = 3k,$$ then k is equal to :

A. 1

B. $-z$

C. z

D. -1

Answer: 2

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10. If the system of linear equations x+ky+3z=0 3x+ky-2z=0 2x+4y-3z=0 has a non-zero solution (x,y,z) then $\frac{xz}{y^2}$ is equal to

A. 30

B. -10

C. 10

D. -30

Answer: 3

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11. If $\begin{vmatrix} x-4 & 2x & 2x \\ 2x & x-4 & 2x \\ 2x & 2x & x-4 \end{vmatrix} = (A+Bx)(x-A)^2$ then the ordered pair (A,B) is equal to

A. $(4, 5)$

B. $(-4, -5)$

C. $(-4, 3)$

D. $(-4, 5)$

Answer: 4

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Jee Advanced

1. 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: 2,3

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2. Let $a, \lambda, \mu \in R,$ Consider the system of linear equations $ax+2y=\lambda 3x-2y=\mu$ Which of the flollowing statement (s) is (are) correct?

A. If $\alpha = -3$ then the system has infinitely many solutions for all values of λ and μ

B. If $\alpha \neq -3$ then the system has a unique solution for all values of λ and μ

C. If $\lambda + \mu = 0$ then the system has infiniely many solutions for $\alpha = -3$

D. if $\lambda + \mu \neq 0$ then the system has no solution for $\alpha = -3$

Answer: B,C,D

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Matrix Match Type

1. Match the following lists :

List I (A, B, C are matrices)	List II
a. If $\|A\| = 2$, then $\|2A^{-1}\| =$ (where A is of order 3)	**p.** 1
b. If $\|A\| = 1/8$, then $\|adj(adj(2A))\| =$ (where A is of order 3)	**q.** 4
c. If $(A+B)^2 = A^2 + B^2$, and $\|A\| = 2$, then $\|B\| =$ (where A and B are of odd order)	**r.** 24
d. $\|A_{2\times 2}\| = 2$, $\|B_{3\times 3}\| = 3$ and $\|C_{4\times 4}\| = 4$, then $\|ABC\|$ is equal to	**s.** 0
	t. does not exist

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2. Match the following lists:

List I	List II
a. If $f(x)$ is an integrable function for $x \in \left[\frac{\pi}{6}, \frac{\pi}{3}\right]$ and $I_1 = \int_{\pi/6}^{\pi/3} \sec^2\theta f(2\sin 2\theta)\, d\theta$, and $I_2 = \int_{\pi/6}^{\pi/3} \text{cosec}^2\theta f(2\sin 2\theta) d\theta$, then $I_1/I_2 =$	**p.** 3
b. If $f(x+1) = f(3+x)\ \forall\ x$, and the value of $\int_a^{a+b} f(x)dx$ is independent of a, then the value of b can be	**q.** 1
c. The value of $2\int_1^4 \frac{\tan^{-1}[x^2]}{\tan^{-1}[x^2] + \tan^{-1}[25 + x^2 - 10x]} dx$ (where [.]denotes the greatest integer function) is	**r.** 2
d. If $I = \int_0^2 \sqrt{x + \sqrt{x + \sqrt{x + \cdots\infty}}}\ dx$ (where $x > 0$), then $[I]$ is equal to (where [.] denotes the greatest integer function)	**s.** 4

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3. If α, β, γ are the roots of $x^3 - 3x^2 + 3x - 1 = \begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$

then match the list I with list II

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4. consider the system of equations

$\lambda x + y + z = 1$

$x + \lambda y + z = \lambda$:

$x + y + \lambda z = \lambda^2$

Now match the following lists:

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5. consider determinant $\Delta = |a_{ij}|$ of order 3. If $\Delta = 2$ the match the following lists.

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