MATHS

BOOKS - ACCURATE PUBLICATION

DETERMINANTS

Example Questions Caryying 2 Marks

1. If $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}$, then show that $|4A| = 64|A|$.

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2. If $A = \begin{bmatrix} 3 & 1 & 1 \\ 1 & 3 & 1 \\ 1 & 1 & 3 \end{bmatrix}$, then show that $|3A| = 27|A|$.

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3. If $A = \begin{bmatrix} 4 & 1 & 1 \\ 1 & 4 & 1 \\ 1 & 1 & 4 \end{bmatrix}$, then show that $|2A| = 8|A|$.

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4. Prove that $\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix} = 0$

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5. Prove that $\begin{vmatrix} 1 & x & x^2 - yz \\ 1 & y & y^2 - zx \\ 1 & z & z^2 - xy \end{vmatrix} = 0$

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6. Prove that $\begin{vmatrix} 1 & p & p^2 - qr \\ 1 & q & q^2 - rp \\ 1 & r & r^2 - pq \end{vmatrix} = 0$

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7. Without expanding the determinant, show that : $\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + 1\right)$ is a factor of : $\left|\begin{bmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{bmatrix}\right|$

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8. Without expanding the determinant, show that : $\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z} + 1\right)$ is a factor of : $\left|\begin{bmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{bmatrix}\right|$

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9. Without expanding the determinant, show that : $\left(\frac{1}{p}+\frac{1}{q}+\frac{1}{r}+1\right)$ is a factor of : $\left|\begin{bmatrix}1+p & 1 & 1\\ 1 & 1+q & 1\\ 1 & 1 & 1+r\end{bmatrix}\right|$

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10. Using the properties of determinant, show that : $\begin{vmatrix}1 & x+y & x^2+y^2\\ 1 & y+z & y^2+z^2\\ 1 & z+x & z^2+x^2\end{vmatrix}=(x-y)(y-z)(z-x)$

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11. Using the properties of determinant, show that : $\begin{vmatrix}1 & p+q & p^2+q^2\\ 1 & q+r & q^2+r^2\\ 1 & r+p & r^2+p^2\end{vmatrix}=(p-q)(q-r)(r-p)$

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12. Using the properties of determinant, show that :

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

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13. Show that:

$$\begin{vmatrix} x-y-z & 2x & 2x \\ 2y & y-z-x & 2y \\ 2z & 2z & z-x-y \end{vmatrix} = (x+y+z)^3$$

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14. Prove that

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

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15. Show that:

$$\begin{vmatrix} p-q-r & 2p & 2p \\ 2q & q-r-p & 2q \\ 2r & 2r & r-p-q \end{vmatrix} = (p+q+r)^3$$

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16. 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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17. Prove that :

$$\begin{vmatrix} \alpha+\beta+\gamma & -\gamma & -\beta \\ -\gamma & \alpha+\beta+\gamma & -\alpha \\ -\beta & -\alpha & \alpha+\beta+\gamma \end{vmatrix} = 2(\alpha+\beta)(\beta+\gamma)(\gamma+\alpha)$$

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18. Prove that :

$$\begin{vmatrix} x+y+z & -z & -y \\ -z & x+y+z & -x \\ -y & -x & x+y+z \end{vmatrix} = 2(x+y)(y+z)(z+x)$$

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19. By using properties of determinants, show that

$$\begin{vmatrix} x+4 & 2x & 2x \\ 2x & x+4 & 2x \\ 2x & 2x & x+4 \end{vmatrix} = (5x+4)(4-x)^2$$

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20. using properties of determinant, prove that

$$\begin{vmatrix} y+k & y & y \\ y & y+k & y \\ y & y & y+k \end{vmatrix} = k^2(3y+k)$$

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21. Prove that:

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

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22. Prove that

$$\begin{vmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ac & bc & a^2+b^2 \end{vmatrix} = 4a^2b^2c^2$$

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23. Using the properties of determinants show that :

$$\left|\begin{bmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ac & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{bmatrix}\right| = (ab+bc+ca)^3$$

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24. Using properties of determinants, prove that:

$$\begin{vmatrix} 3a & -a+b & -a+c \\ -b+a & 3b & -b+c \\ -c+a & -c+b & 3c \end{vmatrix} = 3(a+b+c)(ab+bc+ca)$$

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25. Using the properties of determinant, show 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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26. Using properties of determinants , prove that

$$\begin{vmatrix} x^2+1 & xy & zx \\ xy & y^2+1 & yz \\ zx & yz & z^2+1 \end{vmatrix} = 1+x^2+y^2+z^2$$

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27. Prove that

$$\begin{vmatrix} p^2+1 & pq & pr \\ pq & q^2+1 & qr \\ pr & qr & r^2+1 \end{vmatrix} = 1+p^2+q^2+r^2$$

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28. Show that:

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

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29. Without expanding the following determinant, show that :

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

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30. Without expanding the following determinant, show that :

$$\left|\begin{bmatrix} 3x+y & 2x & x \\ 4x+3y & 3x & 3x \\ 5x+6y & 4x & 6x \end{bmatrix}\right| = x^3$$

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31. Without expanding the following determinant, show that :

$$\left|\begin{bmatrix} 3p+q & 2p & p \\ 4p+3q & 3p & 3p \\ 5p+6q & 4p & 6p \end{bmatrix}\right| = p^3$$

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32. Without expanding show that following :

$$\begin{vmatrix} a & a+b & a+b+c \\ 2a & 3a+2b & 4a+3b+2c \\ 3a & 6a+3b & 10a+6b+3c \end{vmatrix} = a^3$$

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33. Prove that: $\begin{vmatrix} 1 & 1+p & 1+p+q \\ 2 & 3+2p & 4+3p+2q \\ 3 & 6+3p & 10+6p+3q \end{vmatrix} = 1$

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34. Prove that: $\begin{vmatrix} x+y & x & x \\ 5x+4y & 4x & 2x \\ 10x+8y & 8x & 3x \end{vmatrix} = x^3$.

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35. Prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$ =abc $\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$

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36. Show that :

$$\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix} = xyz\left(1+\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$$

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37. Show that :

$$\begin{bmatrix} 1+p & 1 & 1 \\ 1 & 1+q & 1 \\ 1 & 1 & 1+r \end{bmatrix} = pqr\left(1 + \frac{1}{p} + \frac{1}{q} + \frac{1}{r}\right)$$

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38. Prove the following identities :

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

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39. Prove that $\left|\begin{bmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{bmatrix}\right| = abc(a-b)(b-c)(c-a)$

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40. Prove the following identities :

$$\begin{vmatrix} x & x^2 & x^3 \\ y & y^2 & y^3 \\ z & z^2 & z^3 \end{vmatrix} = xyz(x-y)(y-z)(z-x).$$

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41. Without expanding, prove the following

$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = xyz(x-y)(y-z)(z-x)$$

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42. Prove that $\left|\begin{bmatrix} \alpha & \beta & \gamma \\ \alpha^2 & \beta^2 & \gamma^2 \\ \alpha^3 & \beta^3 & \gamma^3 \end{bmatrix}\right| = \alpha\beta\gamma(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$

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43. Prove that $\left|\begin{bmatrix}\alpha & \beta & \gamma \\ \alpha^2 & \beta^2 & \gamma^2 \\ \alpha^3 & \beta^3 & \gamma^3\end{bmatrix}\right| = \alpha\beta\gamma(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$

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44. Using the properties of determinants show that : $\left|\begin{bmatrix}a^2 & b^2 & c^2 \\ bc & ca & ab \\ a & b & c\end{bmatrix}\right| = (a-b)(b-c)(c-a)(ab+bc+ca)$

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45. Using the properties of determinants, show that : $\left|\begin{bmatrix}x^2 & y^2 & z^2 \\ yz & zx & xy \\ x & y & z\end{bmatrix}\right| = (x-y)(y-z)(z-x)(xy+yz+zx).$

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46. Using the properties of determinants show that :

$$\left|\begin{bmatrix} p^2 & q^2 & r^2 \\ qr & rp & pq \\ p & q & r \end{bmatrix}\right| = (p-q)(q-r)(r-p)(pq+qr+rp)$$

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47. Using properties of determinant , show that :

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

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48. Using the properties of determinants, show that :

$$\left|\begin{bmatrix} x^2 & y^2 & z^2 \\ yz & zx & xy \\ x & y & z \end{bmatrix}\right| = (x-y)(y-z)(z-x)(xy+yz+zx).$$

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49. Using the properties of determinants show that :

$$\left|\begin{bmatrix} p^2 & q^2 & r^2 \\ qr & rp & pq \\ p & q & r \end{bmatrix}\right| = (p-q)(q-r)(r-p)(pq+qr+rp)$$

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50. If x,y,z are different and $\Delta = \begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$, show that xyz=-1

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51. Using determinants find the equation of line passing from the points (1, 4) and (- 1, 2).

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52. Using determinants find the equation of line pass passing from the points (2, 3) and (6, 10).

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53. Using determinants find the equation of line passing from the points (2, 3) and (- 1, 2).

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54. If area of $\triangle ABC$ is 12 square units and vertices are A (x, 2), B (4, - 1) and C (- 3, 7), then find the value of x.

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55. If Matrix $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$, then show that $A^2 - 3A - 7I = 0$ and hence find A^{-1} from this equation.

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56. If Matrix $A = \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$, then show that $A^2 - 4A + 7I = 0$ and hence find A^{-1} from this equation.

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57. If Matrix $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, then show that $A^2 - 5A + 7I = 0$ and hence find A^{-1} from this equation.

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Example Questions Caryying 6 Marks

1. Solve by matrix method :

$x + y = 3, y + z = 4, z + x = 5$

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2. Solve by matrix method :

$x + y = 3, y + z = 5, z + x = 4$

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3. Solve by matrix method $x - y + 2z = 7$ $3x + 4y - 5z = -5$

$2x - y + 3z = 12$

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4. Using matrices, solve the following system of equations for x,y and z:

2x+3y + 3z=5, x-2y + z = -4, 3x-y - 2z=3

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5. Using matrix method , solve the equations

$$x - y + z = 4$$

$$2x + y - 3z = 0$$

$$x + y + z = 2$$

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6. Solve by matrix method : x + 2y = 5, y + 2z = 8, z +2x = 5.

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7. Solve by matrix method

$x+2y=7, y+2z=7, z+2x=4$

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8. Solve by matrix method : x + 2y = 7, y + 2z = 4, z + 2x= 7.

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9. Solve the following system of linear equations by matrix method :

$2x-3y+5z=11, 3x+2y-4z=-5, x+y-2z=-3$

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10. Using matrices, solve the following system of equation :

$2x + 8y + 5z = 5, x + y + z = -2, x + 2y - z = 2$

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11. Using matrices, solve the following system of linear equation :

$2x + y + z = 7, x - y - z = -4, 3x + 2y + z = 10$

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12. Use matrix, method to solve the following system of equations :

$x + y - z = 1, 3x + y - 2z = 3, x - y - z = -1$

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13. Use matrix, method to solve the following system of equations :

$2x - 3y + 5z = 16, 3x + 2y - 4z = -4, x + y - 2z = -3$

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14. Use matrix method to slove the following system of equations

$x + y + z = 1$

$x - 2y + 3z = 2$

$x - 3y + 5z = 3$

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15. Use matrix, method to solve the following system of equations :

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

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16. Use matrix, method to solve the following system of equations :

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

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17. Using matrix method , solve the equations

$x - y + z = 4$

$2x + y - 3z = 0$

$x + y + z = 2$

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18. Solve the following system of linear equations by matrix method : $2x. + y - z. = 6, 3x - y + 2z = 3, x + 2y - z = 5$

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19. Solve the following system of linear equations by matrix method : $2x + 3y - z = 6, 5x - 3y + z = 8, 7x + y + 3z = 8$

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20. Solve the following system of linear equations by matrix method:

$2x + 3y + 4z = 4, x - 2y - z = -2, 3x - y + z = 0$

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21. Solve the following system of linear equations by matrix method: $x + 2y + z = 6, 2x + y + 2z = 6, x - y - z = 2$

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22. Solve the following system of linear equations by matrix method : $2x + y - z = 0, 3x + y + z = 3, x - 2y + 2z = 5$

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23. Solve the following system of linear equations by matrix method:

$3x + y + z = 6, 2x + 3y + 5z = 3, \ -x + y + 2z = \ -1$

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24. Solve the following system of linear equations by matrix method: $x + y + z = 6, y + 3z = 11, x - .2y + z = 0$

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25. Solve the following system of linear equations by matrix method :

$x + 2y - 3z = \ -4, 2x + 3y + 2z = 2, 3x - 3y - 4z = 11$

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26. Solve the following system of linear equations by matrix method: $x+y+z=6, y+3z=11, x-.2y+z=0$

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27. Solve the following system of linear equations by matrix method : $3x+y+z=10, 2x-y-z=0, x-y+2z=1$

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28. Solve the following system of linear equations by matrix method : $x+y+z=3, y+3z=4, x-2y-z=0$

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29. Solve the following system of linear equations by matrix method :

$3x - 2y + 3z = 8, 2x + y - z = 1, 4x - 3y + 2z = 4$

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30. Solve the following system of linear equations by matrix method :

$x - 2y + 3z = -5, 3x + y + z = 8, 2x - y + 2z = 1$

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31. Solve the following system of linear equations by matrix method :

$4x + 3y + z = 10, 3x - y + 2z = 8, x - 2y - 3z - 10.$

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32. Solve the following system of linear equation by matrix method : `5x + y - z = - 6, 2x - 3y + 4z = 3, 7x + y - 3z = - 12.

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33. Solve the following equation by Matrix Method, $\frac{1}{x} - \frac{1}{y} + \frac{2}{z} = 7, \frac{3}{x} + \frac{4}{y} - \frac{5}{z} = -5, \frac{2}{x} - \frac{1}{y} + \frac{3}{z} = 12$

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34. Solve the following equation by Matrix Method, $\frac{5}{x} - \frac{1}{y} + \frac{1}{z} = 4, \frac{3}{x} + \frac{2}{y} - \frac{5}{z} = 2, \frac{1}{x} + \frac{3}{y} - \frac{2}{z} = 5$

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35. Solve the following equation by Matrix Method, $\frac{4}{x}+\frac{2}{y}+\frac{3}{z}=2, \frac{1}{x}+\frac{1}{y}+\frac{1}{z}=1, \frac{3}{x}+\frac{1}{y}-\frac{2}{z}=5$

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Type I Multiple Choice Questions

1. If $\begin{vmatrix} 2x & -3 \\ 5 & x \end{vmatrix} = \begin{vmatrix} 4 & 3 \\ 5 & 8 \end{vmatrix}$, then positive value of x is

A. 2

B. 3

C. 4

D. -5

Answer: C

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2. If $\begin{vmatrix} 2x & -3 \\ 5 & x \end{vmatrix} = \begin{vmatrix} 4 & 3 \\ 5 & 8 \end{vmatrix}$, then positive value of x is

A. 2

B. 3

C. 4

D. 5

Answer: C

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3. If $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$, then x is equal to:

A. 6

B. ± 6

C. -6

D. 0

Answer: B

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4. If $\begin{vmatrix} x & 4 \\ 9 & x \end{vmatrix} = \begin{vmatrix} 6 & 4 \\ 9 & 6 \end{vmatrix}$, the x is equal to

A. 6

B. ± 6

C. -6

D. 6,6

Answer: B

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5. If $A = \begin{pmatrix} a & 2 \\ 2 & a \end{pmatrix}$ and $|A|^3 = 125$, then a equals

A. ± 1

B. ± 2

C. ± 3

D. ± 4

Answer: C

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6. If $A = \begin{pmatrix} a & 2 \\ 2 & a \end{pmatrix}$ and $|A|^3 = -125$, then a equals

A. $\pm i$

B. ± 2

C. ± 3

D. ± 4

Answer: B

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7. Which of the following is correct :

A. Determinant is a square matrix

B. Determinant is a number associated to a matrix.

C. Determinant is a number associated to a square matrix

D. None of these

Answer: C

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8. Let $A = \begin{bmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{bmatrix}$, where $0 \leq \theta \leq 2\pi$. Then

A. Det $(A) = 0$

B. Det$(A)\varepsilon(2, \infty)$

C. Det$(A)\varepsilon(2, 4)$

D. Det$(A)\varepsilon[2, 4]$

Answer: D

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9. If A= diag (4, 2, 1) then det. A is equal to :

A. 0

B. 7

C. 8

D. Now of these

Answer: C

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10. If A= diag (3, 2, 1) then det A is equal to

A. 0

B. 6

C. 7

D. Now of these

Answer: B

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

A. 1

B. 0

C. -1

D. 67

Answer: C

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12. Let A be a square matrix of order 3×3. Then I kA I is equal to

:

A. $k|A|$

B. $k^2|A|$

C. $k^3|A|$

D. $3k|A|$

Answer: C

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13. If a,b,c, are in A.P., then the determinant `|{:(x+2,x+3,x+2a),

(x+3,x+4,x+2b),(x+4,x+5,x+2c):}| is

A. 0

B. 1

C. x

D. $2x$

Answer: A

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14. The value of the Det. $\begin{vmatrix} 2 & a & abc \\ 2 & b & bca \\ 2 & c & cab \end{vmatrix}$ is

A. $2abc$

B. abc

C. 0

D. 2

Answer: C

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15. If area of triangle is 35 sq. units with vertices (2,-6), (5, 4) and (k,4) then k is :

A. 12

B. -2

C. $-12, -2$

D. $12, \ -2$

Answer: D

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16. If area of triangle is 4 sq. units with vertices (-2, 0), (0, 4) and (0, k) then k is :

A. 0

B. $0, 8$

C. 8

D. $0, \; -8$

Answer: B

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17. $\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$ and A_{ij} is cofactor of a_{ij} then value of Δ is given by

A. $a_{11} + A_{31} + a_{12}A_{32} + a_{13}A_{33}$

B. $a_{11} + A_{11} + a_{12}A_{21} + a_{13}A_{31}$

C. $a_{21} + A_{11} + a_{22}A_{12} + a_{23}A_{13}$

D. $a_{11} + A_{11} + a_{21}A_{21} + a_{31}A_{31}$

Answer: D

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18. Let A be a non-singular matrix of order 3×3. Then I adj. A I is equal to :`

A. $|A|$

B. $|A|^2$

C. $|A|^3$

D. $3|A|$

Answer: B

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19. Let A be a non-singular square matrix of order 3×3. Then abs(adjA) is

A. $|A|^3$

B. $|A|^4$

C. $|A|^2$

D. $|A|$

Answer: C

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20. If A is a non-singular matrix of order 3 and |A| = 3, then |Adj. A| equals

A. 9

B. 8

C. 10

D. None of these

Answer: A

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21. If A is a non-singular matrix of order 3 and |A| = 2, then | adj A| equals

A. 4

B. 6

C. 8

D. None of these

Answer: A

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22. If A is a non-singular matrix of order 3 and |A| = 4, then |Adj. A| equals

A. 8

B. 12

C. 16

D. None of these

Answer: C

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23. If A is an invertible square matrix of order 4, then $|adj. A|$ is equal to :

A. 25

B. 36

C. 49

D. 64

Answer: A

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24. If A is non-singular matrix of order 3 and $|A| = 5$ then $|adj. A|$ equals :

A. 9

B. 25

C. 16

D. 125

Answer: B

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25. If A is a matrix of order 3×3 and $|A| = 10$ then $|adj. A|$ is

A. 0

B. 10

C. 100

D. 1000

Answer: C

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26. If A is a square matrix of order 3×3 and $|A| = 5$ then $|Adj. A|$ is :

A. 5

B. 125

C. 15

D. 25

Answer: D

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27. If $A = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix}$, then $A(AdjA)$ equals :

A. $\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 3 \\ 3 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 3 \\ 3 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$

Answer: D

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28. If $A = \begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$, then $A(adjA)$ equals

A. $\begin{bmatrix} 0 & 5 \\ 5 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}$

C. $\begin{bmatrix} 5 & 1 \\ 1 & 5 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 5 \\ 5 & 1 \end{bmatrix}$

Answer: B

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29. If $A = \begin{pmatrix} 4 & 3 \\ 3 & 4 \end{pmatrix}$, then $A(AdjA)$ equals :

A. $\begin{bmatrix} 7 & 1 \\ 1 & 7 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 7 \\ 7 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 7 \\ 7 & 0 \end{bmatrix}$

Answer: C

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30. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$, then A(adj A) equals

A. $\begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 10 \\ 10 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 10 & 1 \\ 1 & 10 \end{bmatrix}$

D. None of these

Answer: A

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31. The inverse of a symmetric matrix is :

A. Symmetric

B. Skew-symmetric

C. Diagonal matrix

D. None of these

Answer: A

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32. Prove that $\begin{vmatrix} 1 & x & x^2 - yz \\ 1 & y & y^2 - zx \\ 1 & z & z^2 - xy \end{vmatrix} = 0$

A. $\Delta_1 = -\Delta$

B. $\Delta \neq \Delta_1$

C. $\Delta - \Delta_1 = 0$

D. None of these

Answer: C

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33. 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. $[-\sqrt{2}, \sqrt{2}]$

B. $[-1, 1]$

C. $[-\sqrt{2}, 1]$

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

Answer: A

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34. If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, write the value of x.

A. 3

B. ± 3

C. ± 6

D. 6

Answer: C

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35. The value of determinant $\begin{vmatrix} a-b & b+c & a \\ b-a & c+a & b \\ c-a & a+b & c \end{vmatrix}$ 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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36. 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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37. The determinant $\begin{vmatrix} b^2 - ab & b - c & bc - ac \\ ab - a^2 & a - b & b^2 - ab \\ bc - ca & c - a & ab - a^2 \end{vmatrix}$ equals

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

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

C. 0`

D. None of these

Answer: D

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

A. 0

B. 2

C. 1

D. 3

Answer: C

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39. 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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40. Let $f(t) = \begin{vmatrix} \cos t & t & 1 \\ 2\sin t & t & 2t \\ \sin t & t & t \end{vmatrix}$, then $LT_{t \to o} \dfrac{f(t)}{t^2}$ is euqal to

A. 0

B. -1

C. 2

D. 3

Answer: A

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41. Find the maximum value of :

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1 & 1 & 1+\cos\theta \end{vmatrix}$$

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

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

C. $\sqrt{2}$

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

Answer: A

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42. Consider the determinant

$$f(x) = \begin{vmatrix} 0 & x^2 - a & x^3 - b \\ x^2 + a & 0 & x^2 + c \\ x^4 + b & x - c & 0 \end{vmatrix}$$

Statement -1 f(x) =0 has one root x =0.

Statement -2 The value of skew -symmetric determinant of odd order is always zero.

A. $f(a) = 0$

B. $f(b) = 0$

C. $f(0) = 0$

D. $f(1) = 0$

Answer: C

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43. If $A = \begin{bmatrix} 2 & \lambda & -3 \\ 0 & 2 & 5 \\ 1 & 1 & 3 \end{bmatrix}$, then A^{-1} exists if

A. $\lambda = 2$

B. $\lambda \ne 2$

C. $\lambda = -2$

D. None of these

Answer: D

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44. If A and B are invertibel , then which of the following is not correct

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

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

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

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

Answer: D

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45. If x,y,z are all different from zero and $\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix} = 0$, then value of $x^{-1} + y^{-1} + z^{-1}$ is

A. xyz

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

C. $-x-y-z$

D. -1

Answer: D

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46. Without expanding, prove the following

$$\begin{vmatrix} x & x+y & x+2y \\ x+2y & x & x+y \\ x+y & x+2y & x \end{vmatrix} = 9y^2(x+y)$$

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

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

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

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

Answer: B

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47. There are two values of a which makes determinant,

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

A. 4

B. 5

C. -4

D. 9

Answer: C

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Type Ii Fill In The Blanks Questions

1. If $\begin{vmatrix} 2x & -3 \\ 5 & x \end{vmatrix} = \begin{vmatrix} 4 & -3 \\ 5 & 8 \end{vmatrix}$, then positive value of x is...............

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2. If $\begin{vmatrix} x & 3 \\ 12 & x \end{vmatrix} = \begin{vmatrix} 6 & 3 \\ 12 & 6 \end{vmatrix}$, then x is equal to ....

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3. If $A = \begin{pmatrix} a & -2 \\ -2 & a \end{pmatrix}$ and $|A|^3 = 125$, then a equals............

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4. If A is a square matrix and $|A| = 2$, then the value of $|AA'|$, where A' is the transpose of the matrix A, is ....

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5. A matrix A of order 3×3 is such that $|A| = 4$. Then the value of $|2A|$ is........

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6. A matrix A, of order 3×3, has determinant 4. Then the value o $|3A|$ is ....

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7. The value of the determinant of a matrix A of order 3×3 is 4. Then the value of $|5A|$ is ....

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8. If A= diag (5, 2, l) then det A is equal to :

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9. If A is a square matrix of order 3 and |3A| = k|A|, then write the value of 'k'.

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10. The value of the $\det.\begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix}$ is

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11. The value of $\begin{vmatrix} 1 & p & q+r \\ 1 & q & r+p \\ 1 & r & p+q \end{vmatrix}$ is......

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12. If area of a triangle is 4 sq. units with vertices $(k, 0), (4, 0)$ and $(0, 2)$ then k is............

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13. A is a square matrix of order 3 and $|A| = 7$, then the value of $|adjA|$ is........

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14. If A is non-singular matrix of order 3 and $|A| = 7$ then $|adjA|$ equals.............

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15. If $|A| = 2$, where A is a 2×2 matrix, then $|adjA|$ is ....

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16. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 7 \end{bmatrix}$, then $A(adjA)$ equals........

Watch Video Solution

17. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 9 \end{bmatrix}$, then $A(adjA)$ equals........

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18. Select the Correct Option If A is an invertible matrix of order 2, then det(A^-1) is equal to

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19. If x. y, z are non- real number", then the inverse of matrix $A = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$ is

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

$$\Delta = \begin{vmatrix} \sin^2 A & \cot A & 1 \\ \sin^2 B & \cot B & 1 \\ \sin^2 C & \cot C & 1 \end{vmatrix} = ...$$

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21. The determinant $\Delta = \begin{vmatrix} \sqrt{23}+\sqrt{3} & \sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{46} & 5 & \sqrt{10} \\ 3+\sqrt{115} & \sqrt{15} & 5 \end{vmatrix}$ is equal to

....

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22. The value of the determinant

$$\Delta = \begin{vmatrix} \sin^2 23^\circ \; \sin^2 67^\circ \cos 180^\circ \\ -\sin^2 67^\circ \; -\sin^2 23^\circ \; \cos^2 180^\circ \\ \cos 180^\circ \; \sin^2 23^\circ \; \sin^2 67^\circ \end{vmatrix}$$

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23. If A is matrix of order 3×3, then $|3A| = \dots\dots\dots$

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24. If A is invertible matrix of order 3×3, then $|A^{-1}|$..........

Watch Video Solution

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

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26. If $\cos 2\theta = 0$, then $\begin{vmatrix} 0 & \cos\theta & \sin\theta \\ \cos\theta & \sin\theta & 0 \\ \sin\theta & 0 & \cos\theta \end{vmatrix} = $ ....

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27. If A is matrix of order 3×3, then $\left(A^2\right)^{-1}$=.......

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28. The sum of the products of elements of any row with the co-factors of corresponding elements is equal to ....

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

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30. $\begin{vmatrix} 0 & xyz & x-z \\ y-x & 0 & y-z \\ z-x & z-y & 0 \end{vmatrix} =$ ....

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31. If $f(x) = \begin{vmatrix} (1+x)^{17} & (1+x)^{19} & (1+x)^{23} \\ (1+x)^{23} & (1+x)^{29} & (1+x)^{34} \\ (1+x)^{41} & (1+x)^{43} & (1+x)^{47} \end{vmatrix} = A + Bx + Cx^2$ ...., then $A =$ ....

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Type Iii True Or False Questions

1. The determinant $\Delta = \begin{vmatrix} \cos(x+y) & -\sin(x+y) & \cos 2y \\ \sin x & \cos x & \sin y \\ -\cos x & \sin x & \cos y \end{vmatrix}$ is independent of x only.

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2. The value of $\begin{vmatrix} 1 & 1 & 1 \\ .^n C_n & .^{n+2} C_1 & .^{n+4} C_1 \\ .^n C_2 & .^{n+2} C_2 & .^{n+4} C_2 \end{vmatrix}$ is 8.

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3. If $A = \begin{bmatrix} x & 5 & 2 \\ 2 & y & 3 \\ 1 & 1 & z \end{bmatrix}$, $xyz = 80,\ 3x + 2y + 10z = 20$, then A $adj \cdot A = \begin{bmatrix} 81 & 0 & 0 \\ 0 & 81 & 0 \\ 0 & 0 & 81 \end{bmatrix}$.

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4. If $A = \begin{bmatrix} 0 & 1 & 3 \\ 1 & 2 & x \\ 2 & 3 & 1 \end{bmatrix}$, $A^{-1} = \begin{bmatrix} \frac{1}{2} & -4 & \frac{5}{2} \\ -\frac{1}{2} & 3 & -\frac{3}{2} \\ \frac{1}{2} & y & \frac{1}{2} \end{bmatrix}$ then $x = 1$, $y = -1$

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

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

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7. $|A^{-1}| \neq |A|^{-1}$, where A is non-singular matrix.

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8. If A and B are matrices of order 3 and $|A| = 5, |B| = 3$, then $|3AB| = 27 \times 5 \times 3 = 405$

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9. If the value of a third order determinant is 12, then the value of the determinant formed by replacing each element by its co-factor will be 144.

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10. Without expanding the determinant at any stage, prove that $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+e \end{vmatrix} = 0$ Where a,b,c are in A.P.

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11. $|adj.\ A| = |A|^2$, where a is a square matrix of order two.

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12. The determinant $\begin{vmatrix} \sin A & \cos A & \sin A + \cos B \\ \sin B & \cos A & \sin B + \cos B \\ \sin C & \cos A & \sin C + \cos B \end{vmatrix}$ is equal to zero.

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

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14. Let $\Delta = \begin{vmatrix} a & p & x \\ b & q & y \\ c & r & z \end{vmatrix} = 16,$ then

$$\Delta_1 = \begin{vmatrix} p+x & a+x & a+p \\ q+y & b+y & b+q \\ r+z & c+z & c+r \end{vmatrix} = 32$$

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15. Find the maximum value of :

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1 & 1 & 1+\cos\theta \end{vmatrix}$$

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16. If $A = \begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix}$, then the value of $3|A|$ is 6.

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17. If $\begin{vmatrix} 2x & x+3 \\ 2(x+1) & x+1 \end{vmatrix} = \begin{vmatrix} 1 & 5 \\ 3 & 3 \end{vmatrix}$, then the value of x is 1.

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18. If $A = \begin{pmatrix} a & 3 \\ 3 & a \end{pmatrix}$ and $|A|^3 = -125$, then a equals $+2$.

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19. The value of the determinant $\begin{vmatrix} 2 & 3 & 4 \\ 5 & 6 & 8 \\ 6x & 9x & 12x \end{vmatrix}$ is

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20. If A is a square matrix and $|A| = 2$, then the value of $|AA'|$ is 5.

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21. A matrix A of order 3×3 is such that $|A| = 4$. Then the value of $|2A|$ is 32.

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22. The value of determinant $\begin{vmatrix} 2 & a & abc \\ 2 & b & abc \\ 2 & c & abc \end{vmatrix}$ is 0.

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23. The value of determinant $\begin{vmatrix} 11 & 12 & 13 \\ 12 & 13 & 14 \\ 13 & 14 & 15 \end{vmatrix}$ is 1.

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24. If A is a square matrix of order 3 and |3A| = k|A|, then write the value of 'k'.

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25. prove $\left(A^{-1}\right)' = (A')^{-1}$

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Question Carrying 2 Marks

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

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2. If $\Delta = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$ prove that $2 \le \Delta \le 4$.

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3. Using the properties of determinants, prove that :

$$\left|\begin{bmatrix} a+x & y & z \\ x & a+y & z \\ x & y & a+z \end{bmatrix}\right| = a^2(a+x+y+z)$$

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4. Using properties of determinants, prove that:

$$\begin{vmatrix} 3a & -a+b & -a+c \\ -b+a & 3b & -b+c \\ -c+a & -c+b & 3c \end{vmatrix} = 3(a+b+c)(ab+bc+ca)$$

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5. If a, b, c are positive and unequal, show that value of the determinant $\triangle = \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is negative.

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6. By using properties of determinants, show that :

$$\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = \left(1 - x^3\right)^2$$

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7. Using properties of determinant , show that :

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

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8. Prove that $\begin{vmatrix} (a+1)(a+2) & a+2 & 1 \\ (a+2)(a+3) & a+3 & 1 \\ (a+3)(a+4) & a+4 & 1 \end{vmatrix} = -2$

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9. Without expanding, prove the following

$$\begin{vmatrix} a & a+b & a+2b \\ a+2b & a & a+b \\ a+b & a+2b & a \end{vmatrix} = 9(a+b)b^2$$

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10. Prove that:

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

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11. Prove that

$$\begin{vmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ac & bc & a^2+b^2 \end{vmatrix} = 4a^2b^2c^2$$

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12. Without expanding, prove the following

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

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13. If $a+b+c \neq 0$ and $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = 0$, then using properties of determinant, prove that $a=b=c$

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14. Using the properties of determinants, prove that following :

$$\begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & x(x+1) \\ 3x(1-x) & x(x-1)(x-2) & x(x+1)(x-1) \end{vmatrix} = 6x^2(1-x^2)$$

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15. If $f(x) = \begin{vmatrix} a & -1 & 0 \\ ax & a & -1 \\ ax^2 & ax & a \end{vmatrix}$, using properties of determinants, find the value of $f(2x) - f(x)$

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16. Show that

$$\triangle = \begin{vmatrix} (y+z)^2 & xy & zx \\ xy & (x+z)^2 & yz \\ xz & yz & (x+y)^2 \end{vmatrix} = 2xyz(x+y+z)^3$$

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17. If $\Delta = \begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix}$ and $\Delta_1 = \begin{vmatrix} 1 & 1 & 1 \\ yz & zx & xy \\ x & y & z \end{vmatrix}$ then prove that $\Delta + \Delta_1 = 0$

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18. Using the properties of determinants show that : $\left|\begin{bmatrix} 1 & a^2+bc & a^3 \\ 1 & b^2+ac & b^3 \\ 1 & c^2+ab & c^3 \end{bmatrix}\right| = (a-b)(b-c)(c-a)\left(a^2+b^2+c^2\right)$

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19. Using properties of determinants, prove that: $\begin{vmatrix} x & x^2 & 1+px^3 \\ y & y^2 & 1+py^3 \\ z & z^2 & 1+pz^3 \end{vmatrix} = (1+pxyz)(x-y)(y-z)(z-x)$

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20. Find the equation of the line joining $A(1, 3)$ and $B(0, 0)$ using determinants and find k if $D(k, 0)$ is a point such that area of triangle ABD is 3 sq. units.

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21. For the matrix $A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$, find the numbers a and b such that $A^2 + aA + bI = 0$. Hence find A^{-1}.

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Question Carrying 6 Marks

1. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, find A^{-1} and hence prove that $A^2 - 4A - 5I = 0$.

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2. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, prove thst $A^2 - 4A - 5I = O$ and hence, obtain A^{-1}.

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3. Solve the system of equations by matrix method :

$4x + 3y + 2z = 60, x + 2y + 3z = 45, 6x + 2y + 3z = 70$

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4. Using matrices, solve the following system of equations :

$3x+4y+7z=4, 2x-y+3z=-3, x+2y-3z=8$

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5. Using matrices, solve the following of linear equations :

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

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

$3x-3y-4z=11$

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6. Using matrices, solve the following system of linear equations :

$2x+y-3z=13, x+y-z=6, x-y+4z=-12$

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7. Using matrices, solve the following system of linear equations

:

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

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