DETERMINANT ASSIGNMENT

1. If $\begin{vmatrix} x^2+x & x+1 & x-2 \\ 2x^2+3x-1 & 3x & 3x-3 \\ x^2+2x+3 & 2x-1 & 2x-1 \end{vmatrix} = Ax-12$, then the value of *A* is

(a) 12 (b) 24 (c) –12 (d) –24

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

(a) $a^2+b^2+c^2-3abc$ (b) $3ab$ (c) $3a+5b$ (d) 0

3. $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} =$

(a) *abc* (b) 2*abc* (c) 3*abc* (d) 4*abc*

4. If *a, b, c* are unequal what is the condition that the value of the following determinant is zero $\Delta = \begin{vmatrix} a & a^2 & a^3+1 \\ b & b^2 & b^3+1 \\ c & c^2 & c^3+1 \end{vmatrix}$

(a) $1+abc=0$ (b) $(a-b)(b-c)(c-a)=0$ (c) $a+b+c+1=0$ (d) None of these

5. If $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}=0$, then $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$ is equal to

(a) 0 (b) *abc* (c) –*abc* (d) None of these

6. The value of the determinant $\Delta = \begin{vmatrix} 1^2 & 2^2 & 3^2 & 4^2 \\ 2^2 & 3^2 & 4^2 & 5^2 \\ 3^2 & 4^2 & 5^2 & 6^2 \\ 4^2 & 5^2 & 6^2 & 7^2 \end{vmatrix}$ is equal to

(a) 1 (b) 0 (c) 2 (d) 3

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

(a) 1 (b) 2 (c) 4 (d) 3

8. The parameter, on which the value of the determinant $\begin{vmatrix} 1 & a & a^2 \\ \cos(p-d)x & \cos px & \cos(p+d)x \\ \sin(p-d)x & \sin px & \sin(p+d)x \end{vmatrix}$ does not depend upon is

(a) *a* (b) *p* (c) *d* (d) *x*

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

(a) $2!$ (b) $3!$ (c) $4!$ (d) $5!$

10. If $0<\theta<\frac{\pi}{2}$ and $\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0$ than θ is equal to

(a) $\frac{\pi}{24}, \frac{5\pi}{24}$ (b) $\frac{5\pi}{24}, \frac{7\pi}{24}$ (c) $\frac{7\pi}{24}, \frac{11\pi}{24}$ (d) None of these

11. The value of $\begin{vmatrix} 1 & \cos(\alpha-\beta) & \cos(\alpha-\gamma) \\ \cos(\alpha-\beta) & 1 & \cos(\beta-\gamma) \\ \cos(\alpha-\gamma) & \cos(\beta-\gamma) & 1 \end{vmatrix}$ is

(a) $\begin{vmatrix} \cos\alpha & \sin\alpha & 1 \\ \cos\beta & \sin\beta & 1 \\ \cos\gamma & \sin\gamma & 1 \end{vmatrix}^2$ (b) $\begin{vmatrix} \sin\alpha & \cos\alpha & 0 \\ \sin\beta & \cos\beta & 0 \\ \sin\gamma & \cos\gamma & 0 \end{vmatrix}^2$ (c) $\begin{vmatrix} \cos\alpha & \sin\alpha & 0 \\ \sin\beta & 0 & \cos\beta \\ 0 & \cos\gamma & \sin\gamma \end{vmatrix}^2$ (d) None of these

12. If *a, b, c* are all different and $\begin{vmatrix} a & a^3 & a^4-1 \\ b & b^3 & b^4-1 \\ c & c^3 & c^4-1 \end{vmatrix} = 0$, then the value of $abc(ab+bc+ca)$ is

(a) $a+b+c$ (b) 0 (c) $a^2+b^2+c^2$ (d) $a^2-b^2+c^2$

13. $\begin{vmatrix} a^2+x^2 & ab & ca \\ ab & b^2+x^2 & bc \\ ca & bc & c^2+x^2 \end{vmatrix}$ is divisor of

(a) a^2 (b) b^2 (c) c^2 (d) x^2

14. If $\begin{vmatrix} a & b & a+b \\ b & c & b+c \\ a+b & b+c & 0 \end{vmatrix} = 0$, then *a, b, c* are in

(a) A.P. (b) G.P. (c) H.P. (d) None of these

15. If $\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = k\,abc(a+b+c)^3$, then the value of *k* is

(a) –1 (b) 1 (c) 2 (d) –2

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

(a) Positive (b) $(ac-b^2)(ax^2+2bx+c)$ (c) Negative (d) 0

17. The determinant $\Delta = \begin{vmatrix} a & b & ax+b \\ b & c & bx+c \\ ax+b & bx+c & 0 \end{vmatrix} = 0$, if *a, b, c* are in

(a) *A.P.* (b) *G.P.* (c) *H.P.* (d) None of these

18. The value of the determinant $\begin{vmatrix} 1 & \cos(\alpha-\beta) & \cos\alpha \\ \cos(\alpha-\beta) & 1 & \cos\beta \\ \cos\alpha & \cos\beta & 1 \end{vmatrix}$ is

(a) $\alpha^2+\beta^2$ (b) $\alpha^2-\beta^2$ (c) 1 (d) 0

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

(a) $\frac{9}{4}$ (b) $\frac{4}{9}$ (c) 1 (d) $3\sqrt{3}$

20. If $a \ne p, b \ne q, c \ne r$ and $\begin{vmatrix} p & b & c \\ p+a & q+b & 2c \\ a & b & r \end{vmatrix} = 0$, then $\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c} =$

(a) 3 (b) 2 (c) 1 (d) 0

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

(a) $A=0$ for all θ (b) A is an odd function of θ (c) $A=0$ for $\theta=\alpha+\beta+\gamma$ (d) *A* is independent of θ

22. *l, m, n* are the *pth, qth* and *rth* term of a G.P., all positive, then $\begin{vmatrix} \log l & p & 1 \\ \log m & q & 1 \\ \log n & r & 1 \end{vmatrix}$ equals

(a) –1 (b) 2 (c) 1 (d) 0

23. If *a, b, c* are respectively the p^{th}, q^{th}, r^{th} terms of an A.P., then $\begin{vmatrix} a & p & 1 \\ b & q & 1 \\ c & r & 1 \end{vmatrix} =$

(a) 1 (b) –1 (c) 0 (d) *pqr*

24. The value of the determinant $\begin{vmatrix} bc & ca & ab \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$, where *a, b, c* are the p^{th}, q^{th}, r^{th} terms of a H.P. is

(a) $ap + bq + cr$ (b) $(a+b+c)(p+q+r)$ (c) 0 (d) None of these

25. The value of $\begin{vmatrix} a_1x+b_1y & a_2x+b_2y & a_3x+b_3y \\ b_1x+a_1y & b_2x+a_2y & b_3x+a_3y \\ b_1x+a_1 & b_2x+a_2 & b_3x+a_3 \end{vmatrix}$ is equal to

(a) x^2+y^2 (b) 0 (c) $a_1a_2a_3x^2+b_1b_2b_3y^2$ (d) None of these

26. If α, β are non-real numbers satisfying $x^3-1=0$ then the value of $\begin{vmatrix} \lambda+1 & \alpha & \beta \\ \alpha & \lambda+\beta & 1 \\ \beta & 1 & \lambda+\alpha \end{vmatrix}$ is equal to

(a) 0 (b) λ^3 (c) λ^3+1 (d) None of these

27. The value of the determinant $\begin{vmatrix} {}^5C_0 & {}^5C_3 & 14 \\ {}^5C_1 & {}^5C_4 & 1 \\ {}^5C_2 & {}^5C_5 & 1 \end{vmatrix}$ is

(a) 0 (b) – (6 !) (c) 80 (d) None of these

28. $\begin{vmatrix} \cos C & \tan A & 0 \\ \sin B & 0 & -\tan A \\ 0 & \sin B & \cos C \end{vmatrix}$ has the value

(a) 0 (b) 1 (c) $\sin A \sin B \cos C$ (d) None of these

29. The value of $\begin{vmatrix} x & x^2-yz & 1 \\ y & y^2-zx & 1 \\ z & z^2-xy & 1 \end{vmatrix}$ is

(a) 1 (b) –1 (c) 0 (d) –*xyz*

30. If $\sqrt{-1}=i$ and ω is non real cube root of unity then the value of $\begin{vmatrix} 1 & \omega^2 & 1+i+\omega^2 \\ -i & -1 & -1-i+\omega \\ 1-i & \omega^2-1 & -1 \end{vmatrix}$ is equal to

(a) 1 (b) *i* (c) ω (d) 0

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

(a) 1 if *m* is a multiple of 4 (b) 0 for all real *m* (c) –*i* if *m* is a multiple of 3 (d) None of these

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

(a) 1 (b) 2 (c) –1 (d) None of these

33. Let $f(n) = \begin{vmatrix} n & n+1 & n+2 \\ {}^nP_n & {}^{n+1}P_{n+1} & {}^{n+2}P_{n+2} \\ {}^nC_n & {}^{n+1}C_{n+1} & {}^{n+2}C_{n+2} \end{vmatrix}$ where the symbols have their usual meanings. The *f(n)* is divisible by

(a) n^2+n+1 (b) $(n+1)!$ (c) $n!$ (d) None of these

34. $\begin{vmatrix} {}^xC_1 & {}^xC_2 & {}^xC_3 \\ {}^yC_1 & {}^yC_2 & {}^yC_3 \\ {}^zC_1 & {}^zC_2 & {}^zC_3 \end{vmatrix}$ is equal to

(a) $xyz(x-y)(y-z)(z-x)$ (b) $\frac{xyz}{6}(x-y)(y-z)(z-x)$ (c) $\frac{xyz}{12}(x-y)(y-z)(z-x)$ (d) None of these

35. The solution set of the equation $\begin{vmatrix} 2 & 3 & m \\ 2 & 1 & m^2 \\ 6 & 7 & 3 \end{vmatrix} = 0$ is

(a) (1, 2) (b) (1, –2) (c) (1, –3) (d) (0, 1)

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

(a) $x-(a+b+c)$ (b) $9x^2+a+b+c$ (c) $(a+b+c)$ (d) 0

37. The value of *x* obtained from the equation $\begin{vmatrix} x+\alpha & \beta & \gamma \\ \gamma & x+\beta & \alpha \\ \alpha & \beta & x+y \end{vmatrix} = 0$ will be

(a) 0 and $-(\alpha+\beta+\gamma)$ (b) 0 and $(\alpha+\beta+\gamma)$ (c) 1 and $(\alpha-\beta-\gamma)$ (d) 0 and $(\alpha^2+\beta^2+\gamma^2)$

38. If $ab+bc+ca=0$ and $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$, then one of the value of *x* is

(a) $(a^2+b^2+c^2)^{\frac{1}{2}}$ (b) $\left[\frac{3}{2}(a^2+b^2+c^2)\right]^{\frac{1}{2}}$ (c) $\left[\frac{1}{2}(a^2+b^2+c^2)\right]^{\frac{1}{2}}$ (d) None of these

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

(a) $x=2$ (b) All real *x* (c) $x=0$ (d) None of these

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

(a) $x=5$ (b) *x* has no real value (c) $x=0$ (d) None of these

41. Let $\begin{vmatrix} 1+x & x & x^2 \\ x & 1+x & x^2 \\ x^2 & x & 1+x \end{vmatrix} = ax^5+bx^4+cx^3+dx^2+\lambda x+\mu$ be an identity in *x*, where *a, b, c, d*, λ, μ are independent of *x*. Then the value of λ is

(a) 3 (b) 2 (c) 4 (d) None of these

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

(a) 4 (b) 2 (c) $a+b+c$ (d) None of these

43. The roots of $\begin{vmatrix} x & a & b & 1 \\ \lambda & x & b & 1 \\ \lambda & \mu & x & 1 \\ \lambda & \mu & v & 1 \end{vmatrix} = 0$ are independent of

(a) λ, μ, v (b) *a, b* (c) λ, μ, v, a, b (d) None of these

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

(a) 1 (b) 9 (c) 16 (d) 24

45. If $\Delta_1 = \begin{vmatrix} x-y-z & 2x & 2x \\ 2y & y-z-x & 2y \\ 2z & 2z & z-x-y \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} x+y+2z & x & y \\ z & y+z+2x & y \\ z & x & z+x+2y \end{vmatrix}$, then

(a) $\Delta_1 = 2\Delta_2$ (b) $\Delta_2 = 2\Delta_1$ (c) $\Delta_1 = \Delta_2$ (d) None of these

46. Consider the following statements with reference to determinants

(I) The value of determinant is unchanged if the rows and columns are interchanged

(II) If any two rows or columns of a determinant are interchanged, the sign of the determinant is changed.

(III) If any two rows or columns are identical, the value of determinant is zero

(a) I and III are correct (b) II and III are correct (c) Only I is correct (d) I, II and III are correct

47. Let a_{ij} denote the element of the i^{th} row and j^{th} column in a 3×3 determinant ($1 \le i \le 3,\ 1 \le j \le 3$) and let $a_{ij} = -a_{ji}$ for every *i* and *j* . Then the determinant has all the principal diagonal elements as

(a) 1 (b) –1 (c) 0 (d) None of these

48. If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 5$, then the value of $\begin{vmatrix} b_2c_3 - b_3c_2 & c_2a_3 - c_3a_2 & a_2b_3 - a_3b_2 \\ b_3c_1 - b_1c_3 & c_3a_1 - c_1a_3 & a_3b_1 - a_1b_3 \\ b_1c_2 - b_2c_1 & c_1a_2 - c_2a_1 & a_1b_2 - a_2b_1 \end{vmatrix}$ is

(a) 5 (b) 25 (c) 125 (d) 0

49. Two non-zero distinct numbers *a, b* are used as elements to make determinants of the third order. The number of determinants whose value is zero for all *a, b* is

(a) 24 (b) 32 (c) $a+b$ (d) None of these

50. The value of the determinant Δ of 3rd order is 9 then the value of Δ'^2 where Δ' is a determinant formed by cofactors of the element of Δ is

(a) 9 (b) 81 (c) 729 (d) 6561