EXERCISE–1

1. Let $D = \begin{vmatrix} \sin\theta\cos\phi & \sin\theta\sin\phi & \cos\theta \\ \cos\theta\cos\phi & \cos\theta\sin\phi & -\sin\theta \\ -\sin\theta\sin\phi & \sin\theta\cos\phi & 0 \end{vmatrix}$, then

(A) Δ is independent of θ (B) Δ is independent of ϕ

(C) Δ is a constant (D) None of these

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

(A) $f(x) - f(-x) = 0$ (B) $f(x)\cdot f(-x) = 0$

(C) $f(x) + f(-x) = 0$ (D) $f(x) = f(-x) = 0$

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

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

(C) $4(a-b)(b-c)(c-a)$ (D) $(a+b+c)^3$

4. If $a, b, c > 0$ and $x, y, z \in R$ then the determinant $\begin{vmatrix} (a^x+a^{-x})^2 & (a^x-a^{-x})^2 & 1 \\ (b^y+b^{-y})^2 & (b^y-b^{-y})^2 & 1 \\ (c^z+c^{-z})^2 & (c^z-c^{-z})^2 & 1 \end{vmatrix}$ equal to

(A) $a^xb^yc^z$ (B) $a^{-x}b^{-y}c^{-z}$

(C) $a^{2x}b^{2y}c^{2x}$ (D) Zero

5. The absolute value of the determinant $\begin{vmatrix} -1 & 2 & 1 \\ 3+2\sqrt{2} & 2+2\sqrt{2} & 1 \\ 3-2\sqrt{2} & 2-2\sqrt{2} & 1 \end{vmatrix}$ is

(A) $16\sqrt{2}$ (B) $8\sqrt{2}$ (C) 0 (D) None of these

6. Value of the $D = \begin{vmatrix} a^3-x & a^4-x & a^5-x \\ a^5-x & a^6-x & a^7-x \\ a^7-x & a^8-x & a^9-x \end{vmatrix}$ is

(A) 0 (B) $(a^3-1)(a^6-1)(a^9-1)$

(C) $(a^3+1)(a^6+1)(a^9+1)$ (D) $a^{15}-1$

7. If $D = \begin{vmatrix} a^2+1 & ab & ac \\ ba & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix}$ then D equal to

(A) $1+a^2+b^2+c^2$ (B) $a^2b^2c^2$

(C) $bc+ca+ab$ (D) Zero

8. If a, b and c are non-zero real numbers then $D = \begin{vmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{vmatrix}$ equal to

(A) abc (B) $a^2b^2c^2$ (C) $bc+ca+ab$ (D) Zero

9. Value of $\Delta = \begin{vmatrix} \sin(2\alpha) & \sin(\alpha+\beta) & \sin(\alpha+\gamma) \\ \sin(\beta+\alpha) & \sin(2\beta) & \sin(\gamma+\beta) \\ \sin(\gamma+\alpha) & \sin(\gamma+\beta) & \sin(2\gamma) \end{vmatrix}$ is

(A) $\Delta = 0$ (B) $\Delta = \sin^2\alpha + \sin^2\beta + \sin^2\gamma$

(C) $\Delta = 3/2$ (D) None of these

10. If $\Delta_1 = \begin{vmatrix} 2a & b & e \\ 2d & e & f \\ 4x & 2y & 2z \end{vmatrix}, \Delta_2 = \begin{vmatrix} f & 2d & e \\ 2z & 4x & 2y \\ e & 2a & b \end{vmatrix}$, then the value of $\Delta_1 - \Delta_2$ is

(A) $x + \frac{y}{2} + z$ (B) 2 (C) 0 (D) 3

11. The determinant $D = \begin{vmatrix} a^2(1+x) & ab & ac \\ ab & b^2(1+x) & bc \\ ac & bc & c^2(1+x) \end{vmatrix}$ is divisible by

(A) $1 + x$ (B) $(1+x)^2$ (C) x^2 (D) $x^2 + 1$

12. The determinant $\begin{vmatrix} b_1+c_1 & c_1+a_1 & a_1+b_1 \\ b_2+c_2 & c_2+a_2 & a_2+b_2 \\ b_3+c_3 & c_3+a_3 & a_3+b_3 \end{vmatrix}$

(A) $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ (B) $2\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ (C) $3\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ (D) None of these

13. If $\begin{vmatrix} 1 & a^2 & a^4 \\ 1 & b^2 & b^4 \\ 1 & c^2 & c^4 \end{vmatrix} = k\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$ then k is

(A) $(a+b)(b+c)(c+a)$ (B) $ab + bc + ac$

(C) $a^2b^2c^2$ (D) $a^2 + b^2 + c^2$

14. If A, B, C are angles of a triangle ABC, then $\begin{vmatrix} \sin\frac{A}{2} & \sin\frac{B}{2} & \sin\frac{C}{2} \\ \sin(A+B+C) & \sin\frac{B}{2} & \sin\frac{A}{2} \\ \cos\frac{(A+B+C)}{2} & \tan(A+B+C) & \sin\frac{C}{2} \end{vmatrix}$ equal to

(A) $\frac{3\sqrt{3}}{8}$ (B) $\frac{1}{8}$ (C) $2\sqrt{2}$ (D) 2

15. If $\begin{vmatrix} a^2 & b^2 & c^2 \\ (a+1)^2 & (b+1)^2 & (c+1)^2 \\ (a-2)^2 & (b-1)^2 & (c-1)^2 \end{vmatrix} = k\begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}$, then k is equal to

(A) 1 (B) 2 (C) 4 (D) 0

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

(A) 0 (B) 1 (C) 100 (D) -100

CRAMMER'S RULE

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

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

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

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

has a non-trivial solution if

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

(C) $\alpha + a + b + c = 1$ (D) None of these

18. If the system of equations $x + 2y + 3z = 4$, $x + \lambda y + 2z = 3$, $x + 4y + \mu z = 3$ has an infinite a number of solutions then

(A) $\lambda = 2, \mu = 3$ (B) $\lambda = 2, \mu = 4$

(C) $3\lambda = 2\mu$ (D) None of these

19. The system of the linear equations $x + y - z = 6, x + 2y - 3z = 14$ and $2x + 5y - \lambda z = 9 (\lambda \in R)$ has a unique solution if

(A) $\lambda = 8$ (B) $\lambda \neq 8$ (C) $\lambda = 7$ (D) $\lambda \neq 7$

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

(A) $a + b = 0$ (B) $a + 2b = 0$ (C) $2a + b = 0$ (D) $a + 4b = 0$

21. The system of equation $-2x + y + z = 1, x - 2y + z = -2$, $x + y + \lambda z = 4$ will have no solution if

(A) $\lambda = -2$ (B) $\lambda = -1$ (C) $\lambda = 3$ (D) None of these

22. The value of ' k ' for which the set of equations $3x + ky - 2z = 0$. $x + ky + 3z = 0$, $2x + 3y - 4z = 0$ has a non-trivial solution over the set of rational is

(A) 33/2 (B) 31/2 (C) 16 (D) 15

23. Let $f(x) = \begin{vmatrix} 1 + \sin^2 x & \cos^2 x & 4\sin 2x \\ \sin^2 x & 1 + \cos^2 x & 4\sin 2x \\ \sin^2 x & \cos^2 x & 1 + 4\sin 2x \end{vmatrix}$ then the maximum value of f(x) is

(A) 4 (B) 6 (C) 8 (D) 12

24. If the system of equations

$x + 2y + 2z = 1$

$x - y + 3z = 3$

$x + 11y - z = b$

has solutions, then the value of b lies in the interval

(A) $(-7, -4)$ (B) $(-4, 0)$ (C) $(0, 3)$ (D) $(3, 6)$

25. The system of equations

$kx + (k+1)y + (k-1)z = 0$

$(k+1)x + ky + (k+2)z = 0$

$(k-1)x + (k+2)y + kz = 0$

has a non-trivial solution for

(A) Exactly three real values of k.
(B) Exactly two real values of k.
(C) Exactly one real value of k.
(D) Infinite number of values of k.

26. Number of triplets of a, b and c for which the system of equations, $ax - by = 2a - b$ and $(c+1)x + cy = 10 - a + 3b$ has infinitely many solutions and $x = 1, y = 3$ is one of the solutions, is

(A) Exactly one
(B) Exactly two
(C) Exactly three
(D) Infinitely many

27. The number of values of K for which the system of equations $(K-1)x + (3K+1)y + 2Kz = 0$, $(K-1)x + (4K-2)y + (K+3)z = 0$ and $2x + (3K+1)y + 3(K-1)z = 0$ has a common non zero solution is

(A) 0
(B) 1
(C) 2
(D) 3

28. The values of k for which the system of equations

$kx + y + z = 0$

$x - ky + z = 0$

$x + y + z = 0$

possesses non-zero solutions, are given by

(A) 1,2
(B) $1, -2$
(C) $-1, 1$
(D) $-1, -2$

ANSWER KEY

1.	(B)	**2.**	(C)	**3.**	(A)	**4.**	(D)	**5.**	(A)	**6.**	(A)	**7.**	(A)
8.	(D)	**9.**	(A)	**10.**	(C)	**11.**	(C)	**12.**	(B)	**13.**	(A)	**14.**	(B)
15.	(C)	**16.**	(A)	**17.**	(A)	**18.**	(D)	**19.**	(B)	**20.**	(B)	**21.**	(A)
22.	(A)	**23.**	(B)	**24.**	(A)	**25.**	(C)	**26.**	(B)	**27.**	(C)	**28.**	(C)