Single Correct Answer Type

1. The value of the determinant of nth order; given by $\begin{vmatrix} x & 1 & 1 & ... \\ 1 & x & 1 & ... \\ 1 & 1 & x & ... \\ ... & ... & ... & ... \end{vmatrix}$,

(A) $(x-1)^{n-1}(x+n-1)$
(B) $(x-1)^{n}(x+n-1)$
(C) $(1-x)^{n-1}(x-n+1)$
(D) $(1-x)^{n}(x-n+1)$

2. The determinant $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$ is

(A) >0, if $a>1$ (B) $=0$, if $a=1$ (C) <0, if $a<1$ (D) all of these

3. If $b^2-ac<0$ and $a>0$, then the value of the determinant $\begin{vmatrix} a & b & ax+by \\ b & c & bx+cy \\ ax+by & bx+cy & 0 \end{vmatrix}$ is

(A) positive (B) negative (C) zero (D) b^2+ac

4. The maximum and minimum value of (3×3) determinant where elements belongs to $\{0,1,2,3\}$ is

(A) $45,-45$ (B) 0 (C) $54,-54$ (D) $50,-50$

5. 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

6. If the matrices A, B, $(A+B)$ are non-singular, then $\left[A(A+B)^{-1}B\right]^{-1}$ is equal to

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

7. If $A^2=A$, then $(I+A)^4$ is equal to

(A) $4I+A$ (B) $I+4A$ (C) $I+5A$ (D) $5I+A$

8. If B,C are square matrices of order n and if $A=B+C$, $BC=CB$, $C^2=O$, then for any positive integer p, $A^{p+1}=B^k\left[B+(p+1)C\right]$, k is

(A) $p+1$ (B) p (C) $p-1$ (D) $p+2$

9. Given the matrix A= $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 2 & -1 \end{bmatrix}$. The constants p,q,r such that $A^3=pA^2+qA+rI$, then

(A) $p=1, q=2, r=-1$
(B) $p=1, q=2, r=1$
(C) $p=-1, q=2, r=1$
(D) $p=1, q=-2, r=-1$

10. For two uni-modular complex numbers z_1 and z_2, $\begin{bmatrix} \overline{z_1} & -z_2 \\ \overline{z_2} & z_1 \end{bmatrix}^{-1} \begin{bmatrix} z_1 & z_2 \\ -\bar{z}_2 & \bar{z}_1 \end{bmatrix}^{-1}$ is equal to

(A) $\begin{bmatrix} z_1 & z_2 \\ \bar{z}_1 & \bar{z}_2 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 1/2 & 0 \\ 0 & 1/2 \end{bmatrix}$ (D) $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$

11. If a, b and c are pth, qth, rth terms of an HP, then $\begin{bmatrix} bc & ca & ab \\ p & q & r \\ 1 & 1 & 1 \end{bmatrix}$ is equal to

(A) term containing a, b , c
(B) a non-zero constant
(C) zero
(D) term containing p, q, r

12. $\Delta = \begin{vmatrix} my+nz & mq+nr & nb+nc \\ kz-mx & kr-mp & kb-ma \\ -nx-ky & -np-kq & -na-kb \end{vmatrix}$ is equal to

(A) $\Delta = f(p,q,r)$ (B) $\Delta \neq 0$ (C) $\Delta = f(x,y,z)$ (D) None of these

13. There are three values of t for which the following system of equations has non-trivial solutions .

$(a-t)x+by+cz=0$
$bx+(c-t)y+az=0$
$cx+ay+(b-t)z=0$

We can express the product of the three values of t in the form of a determinant as

(A) $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ (B) $2\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ (C) $3\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ (D) None of these

14. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are coplanar vectors, then $\begin{vmatrix} \vec{a} & \vec{b} & \vec{c} \\ \vec{a}\cdot\vec{a} & \vec{a}\cdot\vec{b} & \vec{a}\cdot\vec{c} \\ \vec{b}\cdot\vec{a} & \vec{b}\cdot\vec{b} & \vec{b}\cdot\vec{c} \end{vmatrix}$ is

(A) –1 (B) 1 (C) 0 (D) $\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

15. If $f(x) = \begin{vmatrix} \cos x & 1 & 0 \\ 1 & \cos x & 1 \\ 0 & 1 & \cos x \end{vmatrix}$, then $f'\left(\frac{\pi}{3}\right)$ equals

(A) $\frac{11\sqrt{3}}{8}$ (B) $\frac{5\sqrt{3}}{8}$ (C) $\frac{-5\sqrt{3}}{8}$ (D) $-\frac{11\sqrt{3}}{8}$

16. If A, B, C are angles of a triangles, then $\begin{vmatrix} e^{2iA} & e^{-iC} & e^{-iB} \\ e^{-iC} & e^{2iB} & e^{-iA} \\ e^{-iB} & e^{-iA} & e^{2iC} \end{vmatrix}$ is equal to

(A) 4 (B) 0 (C) – 4 (D) – 1

17. If $f(x) = \begin{vmatrix} 5+\sin^2 x & \cos^2 x & 4\sin 2x \\ \sin^2 x & 5+\cos^2 x & 4\sin 2x \\ \sin^2 x & \cos^2 x & 5+4\sin 2x \end{vmatrix}$, then

(A) domain of function $f(x) \in (0,\infty)$
(B) range of function $f(x) \in (0,\infty)$
(C) period of function $f(x)$ is 2π
(D) $\lim_{x\to 0} \frac{f(x)-150}{x} = 200$

18. The values of λ and μ for which the equations $x+y+z=3$, $x+3y+2z=6$ and $x+\lambda y+3z=\mu$ have

(A) a unique solution; if $\lambda=5$, $\mu\in\mathbb{R}$
(B) no solution; if $\lambda\neq 5$, $\mu=9$
(C) infinite many solution; if $\lambda=5$, $\mu\neq 9$
(D) none of the above

19. If a point (x,y) moves on a curve and satisfies the equation $\begin{vmatrix} a & b & ax+by \\ b & c & bx+cy \\ ax+by & bx+ay & 0 \end{vmatrix}=0$. Then,

(A) a, b, c form an AP
(B) a, b, c, form an HP
(C) the point (x,y) lies on a curve (pair of straight lines) through the origin
(D) none of the above

20. Let $a=\lim_{x\to 1}\frac{x}{\ln x}-\frac{1}{x\ln x}$; $b=\lim_{x\to 0}\frac{x^3-16x}{4x+x^2}$; $c=\lim_{x\to 0}\frac{\ln(1+\sin x)}{x}$ and $d=\lim_{x\to -1}\frac{(x+1)^3}{3(\sin(x+1)-(x+1))}$, then the matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is

(A) idempotent (B) involuntary (C) non singular (D) nilpotent

21. Value of $\sum(x+y)$, if $\begin{pmatrix} x^3-3x+2 & 2 \\ 3 & y^3+7y^2-35 \end{pmatrix}=\begin{pmatrix} 0 & 2 \\ 3 & 1 \end{pmatrix}$ is _____

22. If $f(x)=\begin{vmatrix} \sin^2 x & \log(\sin x) & \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}} \\ n & \sum_{k=1}^{n}(k) & \prod_{k=1}^{n}(k) \\ \frac{\pi}{4} & \frac{\pi}{2}\log\left(\frac{1}{2}\right) & \frac{\pi}{4} \end{vmatrix}$, then the value of $\int_0^{\pi/2} f(x)\,dx$ is _____

23. If $a\neq p$, $b\neq q$, $c\neq r$ and $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix}=0$, then the value of $\frac{p}{p-a}+\frac{q}{q-b}+\frac{r}{r-c}$ is _____

24. Let P and Q be two square matrices of order 3 such that $P^3=Q^3$ and $P^2Q=Q^2P$ and $P\neq Q$, then $\det\left(P^2+Q^2\right)$ is _____

25. Number of positive integral solutions of $\begin{vmatrix} x^3+1 & x^2y & x^2z \\ xy^2 & y^3+1 & y^2z \\ xz^2 & yz^2 & z^3+1 \end{vmatrix}=11$ is _____

KEY

1.	A	2.	D	3.	B	4.	C	5.	C
6.	B	7.	C	8.	B	9.	C	10.	C
11.	C	12.	D	13.	A	14.	C	15.	B
16.	C	17.	D	18.	D	19.	C	20.	D
21.	-7	22.	0	23.	2	24.	0	25.	3

✼ *Wish You all the Best* ✼