1. $\lim_{x\to 0}\frac{1-\cos\ 2x}{x}$ is
(A) 0 (B) 1 (C) -1 (D) does not exist

2. The value of a for which $f(x)=\begin{cases} ax+1 & if\ x\le 3\\ \frac{x}{3}+3 & if\ x>3\end{cases}$ which is continuous at $x=3$ is
(A) 3 (B) 4 (C) 2 (D) 1

3. $\frac{d}{dx}sin^{-1}\left(\frac{2x}{1+x^2}\right)$ is
(A) $\frac{2}{1+x^2}$ (B) $\frac{2x}{1+x^2}$ (C) $\frac{2x}{(1+x^2)^2}$ (D) 1

4. Derivative of cos^2x w.r.t. $e^{\sin x}$ is
(A) $\frac{-2\cos x}{e^{\sin x}}$ (B) $\frac{2\cos x}{e^{\sin x}}$ (C) $\frac{2\sin x}{e^{\sin x}}$ (D) $\frac{-2\sin x}{e^{\sin x}}$

5. Which of the following function is strictly decreasing on $\left(0,\frac{\pi}{2}\right)$
(A) $2\cos x$ (B) $\cos 3x$ (C) $\tan x$ (D) none of these

6. The maximum value of $|\sin 4x\ +2|$ is
(A) 4 (B) 1 (C) 3 (D) does not exist

7. $\int \sec 2x$ dx is
(A) $\frac{1}{2}ln|\cos 2x+\tan 2x|+C$ (B) $\frac{1}{2}ln|\sec 2x+\tan 2x|+C$
(C) $\frac{1}{2}ln|\sec 2x-\tan 2x|+C$ (D) $\frac{1}{2}ln|\cos 2x-\tan 2x|+C$

8 . $\int_0^1\frac{dx}{1+x^2}$ equals
(A) $\frac{\pi}{3}$ (B) $\frac{2\pi}{3}$ (C) $\frac{\pi}{4}$ (D) 0

9. $\int_{-1}^{1}x^{15}\cos^4 x$ dx equals
(A) 0 (B) $\frac{1}{15}$ (C) $-\frac{1}{15}$ (D) $\frac{1}{3}$

10. The number of points at which the function $f(x)=|x-0.5|+|x-1|$ does not have a derivative in $(0,3)$ is
(A) 1 (B) 2 (C) 3 (D) 0

11. If $f(x)=\int_0^x\cos 2t\, e^t\, dt$, then $f'(0)$ is
(A) 0 (B) 1 (C) e (D) $\frac{1}{e}$

12. Which of the following is true
(A) Every continuous function is differentiable
(B) $f(x)$ is differentiable implies $f'(x)$ is continuous
(C) Every differentiable function is not continuous
(D) $f(x)=x|x|$ is differentiable at $x=0$

13. The area bounded by the curve $y=\cos x$ between $x=0$ and $x=\frac{\pi}{2}$ is
(A) 1 (B) 2 (C) $\frac{1}{2}$ (D) $\frac{\pi}{2}$

14. The order of the differential equation $\left(\frac{dy}{dx}\right)^4+6y\frac{d^2y}{dx^2}=0$ is
(A) 4 (B) 2 (C) 1 (D) 3

15. A solution to the differential equation $\frac{dy}{dx}=\frac{1+y^2}{1+x^2}$ with $y(0)=\frac{\pi}{4}$

(A) $y - x = \frac{\pi}{4}$ (B) $tan^{-1}y = \frac{\pi}{4}$

(C) $tan^{-1}y - tan^{-1}x = \frac{\pi}{4}$ (D) $tan^{-1}y + tan^{-1}x = \frac{\pi}{4}$

16. The algebraic sum of the deviation from mean is
(A) maximum (B) least
(C) zero (D) none of these

17. Three identical dice are rolled. The probability that the same number will appear on each of them is
(A) $\frac{1}{6}$ (B) $\frac{1}{18}$ (C) $\frac{1}{36}$ (D) none of these

18. Ram, his wife and 8 delegates are to be seated on a round dining table at random. The probability that the host and his wife sit together is
(A) $\frac{1}{9}$ (B) $\frac{2}{9}$ (C) $\frac{1}{5}$ (D) $\frac{1}{10}$

19. The value of determinant $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ is
(A) 1 (B) 0 (C) x (D) xy

20. If $A = \begin{bmatrix} 1 & -2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 2 \\ 1 & 1 \end{bmatrix}$ then, AB equals
(A) $\begin{bmatrix} -3 & -2 \\ 10 & 7 \end{bmatrix}$ (B) $\begin{bmatrix} -3 & 10 \\ -2 & 7 \end{bmatrix}$ (C) $\begin{bmatrix} -3 & 10 \\ 7 & -2 \end{bmatrix}$ (D) $\begin{bmatrix} 3 & 10 \\ 2 & 7 \end{bmatrix}$

21. If A is any square matrix, then $A + A^T$ is
(A) Identity matrix (B) zero matrix
(C) skew-symmetric matrix (D) symmetric matrix

22. If $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$ then angle between $\vec{a}$ and $\vec{b}$ is
(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{2}$ (C) 0 (D) $\frac{\pi}{3}$

23. The projection of the vector $\vec{i} - 2\vec{j} + \vec{k}$ on the vector $\vec{i} - 4\vec{j} + 7\vec{k}$ is
(A) $\frac{\sqrt{5}}{2}$ (B) $\frac{\sqrt{6}}{16}$ (C) $2\frac{1}{9}$ (D) $\frac{9}{19}$

24. Let $\vec{a}$ and $2\vec{b}$ denotes the diagonals of a parallelogram. Then the area of the parallelogram is given by
(A) $\frac{1}{2}|\vec{a} \times \vec{b}|$ (B) $|\vec{a} \times \vec{b}|$ (C) $2|\vec{a} \times \vec{b}|$ (D) None of these

25. In a ΔABC, $\cot\frac{1}{2}A + \cot\frac{1}{2}B + \cot\frac{1}{2}C$ equals
(A) 1 (B) 0 (C) $\cot\frac{1}{2}A \cot\frac{1}{2}B \cot\frac{1}{2}C$ (D) None of these

26. If $sin\left\{\frac{1}{2}\cos^{-1}x\right\} = 1$, then x equals
(A) -1 (B) 1 (C) 0 (D) $\frac{1}{5}$

27. The equation $\cos x + \sin x = 2$ has
(A) only one solution (B) two solutions
(C) infinite number of solutions (D) no solution

28. If the r^{th} term in the expansion of $\left(\frac{x}{3} - \frac{2}{x^2}\right)^{10}$ contains x^4, then r is equal to
(A) 2 (B) 3 (C) 4 (D) 5

29. The product of r consecutive positive integers, divided by $r!$ is
(A) a proper fraction
(B) equal to r
(C) a positive integer
(D) none of these

30. If ω is a cube root of unity , then $(4+\omega+4\omega^2)^4$ equals
(A) 27 (B) 81ω (C) 27ω (D) 81

31. Which of the following is correct
(A) $3+4i > 2+3i$
(B) $6+2i > 3+3i$
(C) $5+9i > 5+8i$
(D) none of these

32. The area of the triangle with vertices $(-4,-1),(1,2)$ and $(4,-3)$ is
(A) 17 (B) 16 (C) 15 (D) 14

33. The equation of the line through $(2,-4)$ parallel to $x-$ axis is
(A) $y=-4$ (B) $y=2$ (C) $x=2$ (D) $x=-4$

34. P and Q are the points on the line joining $A(-2,5)$ and $B(3,1)$ such the $AP=PQ=QB$. Then the mid-point of PQ is
(A) $\left(\frac{1}{2},4\right)$ (B) $(2,3)$ (C) $\left(\frac{1}{2},3\right)$ (D) $(-1,4)$

35. Two circles $x^2+y^2=6$ and $x^2+y^2-6x+8=0$ are given. Then the equation of the circle through their points of intersection and the point $(1,1)$ is
(A) $x^2+y^2-6x+4=0$
(B) $x^2+y^2-3x+8=0$
(C) $x^2+y^2-4y+2=0$
(D) none of these

36. Foot of perpendicular down from $(0,5)$ to the line $3x-4y-5=0$ is
(A) $(1,-1)$ (B) $\left(2,\frac{1}{4}\right)$ (C) $\left(\frac{5}{3},0\right)$ (D) $(3,1)$

37. The angle between the two plane $4x+8y+z-8=0$ and $y+z-4=0$ is
(A) 90° (B) 45° (C) 60° (D) 30°

38. The distance between the two planes $2x+3y+4z=4$ and $2x+3y+4z=6$ is
(A) 2 (B) 4 (C) $\frac{2}{\sqrt{29}}$ (D) 8

39. A sphere is uniquely known if we know it is known the following points
(A) one (B) two (C) three (D) four

40. The image of the point $(6,3,-4)$ with respect to $yz-$plane is
(A) $(-6,3,-4)$ (B) $(6,-3,4)$ (C) $(-6,-3,-4)$ (D) $(6,0,-4)$

Solution Keys

1. (A) 2. (D) 3. (A) 4. (D) 5. (A) 6. (C) 7. (B) 8. (C) 9. (A) 10. (B)
11. (B) 12. (D) 13. (A) 14. (B) 15. (*) 16. (C) 17. (C) 18. (B) 19. (D) 20. (A)
21. (D) 22. (B) 23. (C) 24. (B) 25. (C) 26. (A) 27. (D) 28. (B) 29. (C) 30. (B)
31. (D) 32. (A) 33. (A) 34. (C) 35. (D) 36. (D) 37. (B) 38. (C) 39. (D) 40. (A)