1. The value of C in $(0,2)$ satisfying the mean value theorem for the function $f(x)=x(x-1)^2$, $x\in[0,2]$ is equal to

(a) $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $\frac{1}{3}$ (d) $\frac{2}{3}$

2. $\frac{d}{dx}\left[\cos^2\left(\cot^{-1}\sqrt{\frac{2+x}{2-x}}\right)\right]$ is

(a) $-\frac{3}{4}$ (b) $-\frac{1}{2}$ (c) $\frac{1}{2}$ (d) $\frac{1}{4}$

3. For the function $f(x)=x^3-6x^2+12x-3; x=2$ is

(a) a point of minimum (b) a point of inflexion

(c) not a critical point (d) a point of maximum

4. The function $f(x)=|\cos x|$ is

(a) everywhere continuous and differentiable

(b) everywhere continuous but not differentiable at odd multiples of $\frac{\pi}{2}$

(c) neither continuous nor differentiable at $(2n+1)\frac{\pi}{2}, n\in Z$

(d) not differentiable everywhere

5. If $y=2x^{3x}$, then $\frac{dy}{dx}$ at $x=1$ is

(a) 2 (b) 6 (c) 3 (d) 1

6. Let the function satisfy the equation $f(x+y)=f(x)f(y)$ for all $x,y\in R$, where $f(0)\neq 0$. If $f(5)=3$ and $f'(0)=2$, then $f'(5)$ is

(a) 6 (b) 0 (c) 5 (d) -6

7. $\int \frac{1}{x\left[6(\log x)^2+7\log x+2\right]}dx =$

(a) $\frac{1}{2}\log\left|\frac{2\log x+1}{3\log x+2}\right|+C$ (b) $\log\left|\frac{2\log x+1}{3\log x+2}\right|+C$

(c) $\log\left|\frac{3\log x+2}{2\log x+1}\right|+C$ (d) $\frac{1}{2}\log\left|\frac{3\log x+2}{2\log x+1}\right|+C$

8. $\int \frac{\sin\frac{5x}{2}}{\sin\frac{x}{2}}dx =$

(a) $2x+\sin x+2\sin 2x+C$ (b) $x+2\sin x+2\sin 2x+C$

(c) $x+2\sin x+\sin 2x+C$ (d) $2x+\sin x+\sin 2x+C$

9. $\int_1^5\left(|x-3|+|1-x|\right)dx =$

(a) 12 (b) $\frac{5}{6}$ (c) 21 (d) 10

10. $\lim_{n\to\infty}\left(\frac{n}{n^2+1^2}+\frac{n}{n^2+2^2}+\frac{n}{n^2+3^2}+\ldots\ldots+\frac{1}{5n}\right)=$

(a) $\frac{\pi}{4}$ (b) $\tan^{-1}3$ (c) $\tan^{-1}2$ (d) $\frac{\pi}{2}$

11. The area of the region bounded by the line $y=3x$ and the curve $y=x^2$ in sq. units is

(a) 10 (b) $\frac{9}{2}$ (c) 9 (d) 5

12. The area of the region bounded by the line $y=x$ and the curve $y=x^3$ is

(a) 0.2 sq. units (b) 0.3 sq. units

(c) 0.4 sq. units (d) 0.5 sq. units

13. If $\vec{a},\vec{b},\vec{c}$ are three non-coplanar vectors and p,q,r are vectors defined by

$\vec{p}=\frac{\vec{b}\times\vec{c}}{\left[\vec{a}\vec{b}\vec{c}\right]},\vec{q}=\frac{\vec{c}\times\vec{a}}{\left[\vec{a}\vec{b}\vec{c}\right]},\vec{r}=\frac{\vec{a}\times\vec{b}}{\left[\vec{a}\vec{b}\ \vec{c}\right]}$, then $\left(\vec{a}+\vec{b}\right)\cdot\vec{p}+\left(\vec{b}+\vec{c}\right)\cdot\vec{q}+\left(\vec{c}+\vec{a}\right)\cdot\vec{r}$ is

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

14. If lines $\frac{x-1}{-3}=\frac{y-2}{2k}=\frac{z-3}{2}$ and $\frac{x-1}{3k}=\frac{y-5}{1}=\frac{z-6}{-5}$ are mutually perpendicular, then k is equal to

(a) $-\frac{10}{7}$ (b) $-\frac{7}{10}$ (c) -10 (d) -7

15. The distance between the two planes $2x+3y+4z=4$ and $4x+6y+8z=12$ i

(a) 2 units (b) 8 units (c) $\frac{2}{\sqrt{29}}$ units (d) 4 units

16. The sine of the angle between the straight line $\frac{x-2}{3}=\frac{y-3}{4}=\frac{4-z}{-5}$ and the plane $2x-2y+z=5$ is

(a) $\frac{1}{5\sqrt{2}}$ (b) $\frac{2}{5\sqrt{2}}$ (c) $\frac{3}{50}$ (d) $\frac{3}{\sqrt{50}}$

17. The equation $xy=0$ in three-dimensional space represents

(a) a pair of straight lines (b) a plane

(c) a pair of planes at right angles (d) a pair of parallel planes

18. The plane containing the point $(3,2,0)$ and the line $\frac{x-3}{1}=\frac{y-6}{5}=\frac{z-4}{4}$ is

(a) $x-y+z=1$ (b) $x+y+z=5$

(c) $x+2y-z=1$ (d) $2x-y+z=5$

19. Corner points of the feasible region for an LPP are $(0,2),(3,0),(6,0),(6,8)$ and $(0,5)$. Let $z=4x+6y$ be the objective function. The minimum value of z occurs at

(a) Only (0,2) (b) Only $(3,0)$

(c) The mid-point of the line segment joining the points $(0,2)$ and $(3,0)$

(d) Any point on the line segment joining the points $(0,2)$ and $(3,0)$

20. A die is thrown 10 times. The probability that an odd number will come up at least once is

(a) $\frac{11}{1024}$ (b) $\frac{1013}{1024}$ (c) $\frac{1023}{1024}$ (d) $\frac{1}{1024}$

21. A random variable X has the following probability distribution :

X	0	1	2
P(X)	$\frac{25}{36}$	k	$\frac{1}{36}$

If the mean of the random variable X is $\frac{1}{3}$, then the variance is

(a) $\frac{1}{18}$ (b) $\frac{5}{18}$ (c) $\frac{7}{18}$ (d) $\frac{11}{18}$

22. If a random variable X follows the binomial distribution with parameters $n=5$, p and $P(X=2)=9P(X=3)$, then p is equal to

(a) 10 (b) $\frac{1}{10}$ (c) 5 (d) $\frac{1}{5}$

23. Two finite sets have m and n elements respectively. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. The values of m and n respectively are

(a) 7, 6 (b) 5,1 (c) 6, 3 (d) 8,7

24. If $[x]^2-5[x]+6=0$, where $[x]$ denotes the greatest integer function, then

(a) $x\in[3,4]$ (b) $x\in[2,4)$ (c) $x\in[2,3]$ (d) $x\in(2,3]$

25. If in two circles, arcs of the same length subtend angles 30° and 78° at the centre, then the ratio of their radii is

(a) $\frac{5}{13}$ (b) $\frac{13}{5}$ (c) $\frac{13}{4}$ (d) $\frac{4}{13}$

26. If ΔABC is right angled at C, then the value of $\tan A+\tan B$ is

(a) $\mathrm{a}+\mathrm{b}$ (b) $\frac{\mathrm{a}^2}{\mathrm{bc}}$ (c) $\frac{c^2}{ab}$ (d) $\frac{b^2}{ac}$

27. The real value of ' α ' for which $\frac{1-i\sin\alpha}{1+2i\sin\alpha}$ is purely real is

(a) $(\mathrm{n}+1)\frac{\pi}{2},\mathrm{n}\in\mathbb{N}$ (b) $(2\mathrm{n}+1)\frac{\pi}{2},\mathrm{n}\in\mathbb{N}$

(c) $\mathrm{n}\pi,\mathrm{n}\in\mathbb{N}$ (d) $(2\mathrm{n}-1)\frac{\pi}{2},\mathrm{n}\in\mathbb{N}$

28. The length of a rectangle is five times the breadth. If the minimum perimeter of the rectangle is 180 cm , then

(a) Breadth ≤ 15 cm (b) Breadth ≥ 15 cm

(c) Length ≤ 15 cm (d) Length $=15$ cm

29. The value of ${}^{49}C_3+{}^{48}C_3+{}^{47}C_3+{}^{46}C_3+{}^{45}C_3+{}^{45}C_4$ is

(a) $^{50}C_4$ (b) $^{50}C_3$ (c) $^{50}C_2$ (d) $^{50}C_1$

30. In the expansion of $(1+x)^n$ $\frac{C_1}{C_0}+2\frac{C_2}{C_1}+3\frac{C_3}{C_2}+\ldots\ldots+n\frac{C_n}{C_{n-1}}$ is equal to

(a) $\frac{n(n+1)}{2}$ (b) $\frac{n}{2}$ (c) $\frac{n+1}{2}$ (d) $3n(n+1)$

31. If S_n stands for sum to n-terms of a G.P. with ' a ' as the first term and ' r ' as the common ratio then $S_n : S_{2n}$ is

(a) r^n+1 (b) $\frac{1}{\mathbf{r}^n+1}$ (c) $\mathbf{r}^n-1$ (d) $\frac{1}{\mathbf{r}^n-1}$

32. If A.M. and G.M. of roots of a quadratic equation are 5 and 4 respectively, then the quadratic equation is

(a) $x^2-10x-16=0$ (b) $x^2+10x+16=0$

(c) $x^2+10x-16=0$ (d) $x^2-10x+16=0$

33. The angle between the line $x+y=3$ and the line joining the points $(1,1)$ and $(-3,4)$ is

(a) $\tan^{-1}(7)$ (b) $\tan^{-1}\left(-\frac{1}{7}\right)$ (c) $\tan^{-1}\left(\frac{1}{7}\right)$ (d) $\tan^{-1}\left(\frac{2}{7}\right)$

34. The equation of parabola whose focus is $(6,0)$ and directrix is $x=-6$ is

(a) $y^2=24x$ (b) $y^2=-24x$ (c) $x^2=24y$ (d) $x^2=-24y$

35. $\lim_{x\to\frac{\pi}{4}}\frac{\sqrt{2}\cos x-1}{\cot x-1}$ is equal to

(a) 2 (b) $\sqrt{2}$ (c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}$

36. The negation of the statement "For every real number $x; x^2+5$ is positive" is

(a) For every real number $x; x^2+5$ is not positive.

(b) For every real number $x; x^2+5$ is negative.

(c) There exists at least one real number x such that x^2+5 is not positive.

(d) There exists at least one real number x such that x^2+5 is positive.

37. Let a,b,c,d and e be the observations with mean m and standard deviation S. The standard deviation of the observations $a+k, b+k, c+k, d+k$ and $e+k$ is

(a) kS (b) S+k. (c) $\frac{S}{k}$ (d) S

38. Let $f: R\to R$ be given by $f(x)=\tan x$. Then $f^{-1}(1)$ is

(a) $\frac{\pi}{4}$ (b) $\left\{n\pi+\frac{\pi}{4} : n\in Z\right\}$ (c) $\frac{\pi}{3}$ (d) $\left\{n\pi+\frac{\pi}{3} : n\in Z\right\}$

39. Let $f: R\to R$ be defined by $f(x)=x^2+1$. Then the pre images of 17 and -3 respectively are

(a) $\phi,\{4,-4\}$ (b) $\{3,-3\},\phi$ (c) $\{4,-4\},\phi$ (d) : $\{4,-4\},\{2,-2\}$

40. Let $(gof)(x)=\sin x$ and $(f\circ g)(x)=(\sin\sqrt{x})^2$. Then

(a) $f(x)=\sin^2 x, g(x)=x$ (b) $f(x)=\sin\sqrt{x}, g(x)=\sqrt{x}$

(c) $f(x)=\sin^2 x, g(x)=\sqrt{x}$ (d) $f(x)=\sin\sqrt{x}, g(x)=x^2$

41. Let $A=\{2,3,4,5,..........16,17,18\}$. Let R be the relation on the set A of ordered pairs of positive integers defined by (a, b) $R(c,d)$ if and only if ad = bc for all (a,b), (c,d) in $A\times A$ Then the number of ordered pairs of the equivalence class of $(3,2)$ is

(a) 4 (b) 5 (c) 6 (d) 7

42. If $\cos^{-1}x+\cos^{-1}y+\cos^{-1}z=3\pi$, then $x(y+z)+y(z+x)+z(x+y)$ equals to

(a) 0 (b) 1 (c) 6 (d) 12

43. If $2\sin^{-1}x-3\cos^{-1}x=4, x\in[-1,1]$ then $2\sin^{-1}x+3\cos^{-1}x$ is equal to

(a) $\frac{4-6\pi}{5}$ (b) $\frac{6\pi-4}{5}$ (c) $\frac{3\pi}{2}$ (d) 0

44. If A is a square matrix such that $A^2=A$, then $(I+A)^3$ is equal to

(a) 7 A − I (b) 7 A (c) 7 A + I (d) I − 7 A

45. If $A=\begin{pmatrix}1 & 1\\ 1 & 1\end{pmatrix}$, then A^{10} is equal to

(a) 2^8 A (b) 2^9 A (c) 2^{10} A (d) 2^{11} A

46. If $f(x)=\begin{vmatrix}x-3 & 2x^2-18 & 2x^3-81\\ x-5 & 2x^2-50 & 4x^3-500\\ 1 & 2 & 3\end{vmatrix}$, then $f(1)\cdot f(3)+f(3).f(5)+f(5).f(1)$ is

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

47. Let $f(x)=\begin{vmatrix}\cos x & x & 1\\ 2\sin x & x & 2x\\ \sin x & x & x\end{vmatrix}$. Then $\lim_{x\to 0}\frac{f(x)}{x^2}=$

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

48. Which one of the following observations is correct for the features of logarithm function to any base $b>1$?

(a) The domain of the logarithm function is R, the set of real numbers.

(b) The range of the logarithm function is R^+, the set of all positive real numbers.

(c) The point $(1,0)$ is always on the graph of the logarithm function.

(d) The graph of the logarithm function is decreasing as we move from left to right.

49. If $P=\begin{bmatrix}1 & \alpha & 3\\ 1 & 3 & 3\\ 2 & 4 & 4\end{bmatrix}$ is the adjoint of a 3×3 matrix A and $|A|=4$, then α is equal to

(a) 4 (b) 5 (c) 11 (d) 0

50. If $A=\begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$ and $B=\begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$, then $\frac{dB}{dx}$ is

(a) 3 A (b) -3 B (c) 3 B+1 (d) 1-3A

51. If $f(x)=xe^{x(1-x)}$ then $f(x)$ is

(a) increasing in R (b) decreasing in R

(c) decreasing in $\left[-\frac{1}{2},1\right]$ (d) increasing in $\left[-\frac{1}{2},1\right]$

52. $\int \frac{\sin x}{3+4\cos^2 x}\cdot dx =$

(a) $-\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{2\cos x}{\sqrt{3}}\right)+C$ (b) $\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{\cos x}{3}\right)+C$

(c) $\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{\cos x}{3}\right)+C$ (d) $-\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{2\cos x}{3}\right)+C$

53. $\int_{-\pi}^{\pi}(1-x^2)\sin x\cdot\cos^2 x dx =$

(a) $\pi-\frac{\pi^2}{3}$ (b) $2\pi-\pi^3$ (c) $\pi-\frac{\pi^3}{2}$ (d) 0

54. The function $x^x; x>0$ is strictly increasing at

(a) $\forall x\in R$ (b) $x<\frac{1}{e}$ (c) $x>\frac{1}{e}$. (d) $x<0$

55. The maximum volume of the right circular cone with slant height 6 units is

(a) $4\sqrt{3}\pi$ cubic units (b) $16\sqrt{3}\pi$ cubic units

(c) $3\sqrt{3}\pi$ cubic units (d) $6\sqrt{3}\pi$ cubic units

56. The vectors $\overrightarrow{AB}=3i+4k$ and $\overrightarrow{AC}=5i-2j+4k$ are the sides of $a\ddot{A}ABC$. The length of the median through A is

(a) $\sqrt{18}$ (b) $\sqrt{72}$ (c) $\sqrt{33}$ (d) $\sqrt{288}$

57. The volume of the parallelopiped whose co-terminous edges are $j+k, i+k$ and $i+j$ is

(a) 6 cu.units (b) 2 cu.units (c) 4 cu.units (d) 3 cu.units

58. Let $\vec{a}$ and $\vec{b}$ be two unit vectors and θ is the angle between them. Then $\vec{a}+\vec{b}$ is a unit vector if

(a) $\theta=\frac{\pi}{4}$ (b) $\theta=\frac{\pi}{3}$ (c) $\theta=\frac{2\pi}{3}$ (d) $\theta=\frac{\pi}{2}$

59. The solution of $e^{\frac{dy}{dx}}=x+1, y(0)=3$ is

(a) $y-2=x\log x-x$ (b) $y-x-3=x\log x$

(c) $y-x-3=(x+1)\log(x+1)$ (d) $y+x-3=(x+1)\log(x+1)$

60. The family of curves whose x and y intercepts of a tangent at any point are respectively double the x and y coordinates of that point is

(a) $xy = C$ (b) $x^2 + y^2 = C$ (c) $x^2 - y^2 = C$ (d) $\frac{y}{x} = C$