1. If $f(x)=\begin{cases}\dfrac{\sin x}{x}+\cos x, & \text{when } x\neq 0\\ 2, & \text{when } x=0\end{cases}$, then :

(a) $\lim\limits_{x\to 0^+} f(x)\neq 2$

(b) $\lim\limits_{x\to 0^-} f(x)=0$

(c) $f(x)$ is continuous at $x=0$

(d) none of the above

2. If $y=f(x)=\dfrac{x+2}{x-1}$, then x is equal to :

(a) $f(y)$ (b) $2f(y)$

(c) $\dfrac{1}{f(y)}$ (d) none of these

3. The value of b and c for which the identity $f(x+1)-f(x)=8x+3$ is satisfied, where $f(x)=bx^2+cx+d$, are :

(a) $b=2, c=1$ (b) $b=4, c=-1$

(c) $b=-1, c=4$ (d) $b=-1, c=1$

4. The range of the function $f(x)=x^2-6x+7$ is :

(a) $(-\infty, 0)$ (b) $[-2, \infty)$

(c) $(-\infty, \infty)$ (d) $(-\infty, -2)$

5. If $f(x)=x\tan^{-1}x$, then $f'(1)$ is equal to :

(a) $1+\dfrac{\pi}{4}$ (b) $\dfrac{1}{2}+\dfrac{\pi}{4}$

(c) $\dfrac{1}{2}-\dfrac{\pi}{4}$ (d) 2

6. $\dfrac{d}{dx}\sqrt{\dfrac{1-\sin 2x}{1+\sin 2x}}$ is equal to :

(a) $\sec^2 x$ (b) $-\sec^2\left(\dfrac{\pi}{4}-x\right)$

(c) $\sec^2\left(\dfrac{\pi}{4}+x\right)$ (d) $\sec^2\left(\dfrac{\pi}{4}-x\right)$

7. If $y=x^2+\dfrac{1}{x^2+\dfrac{1}{x^2+\dfrac{1}{x^2+\ldots\infty}}}$, then $\dfrac{dy}{dx}$ is equal to :

(a) $\dfrac{2xy}{2y-x^2}$ (b) $\dfrac{xy}{y+x^2}$

(c) $\dfrac{xy}{y-x^2}$ (d) $\dfrac{2x}{2+\dfrac{x^2}{y}}$

8. The function $f(x)=\max[(1-x),(1+x),2]$, $x\in(-\infty,\infty)$ is :

(a) continuous at all points

(b) differentiable at all points

(c) differentiable at all points except at $x=1$ and $x=-1$

(d) none of the above

9. If $f(x_1)-f(x_2)=f\left(\dfrac{x_1-x_2}{1-x_2x_2}\right)$ for $x_1, x_2\in[-1, 1]$, then $f(x)$ is equal to :

(a) $\tan^{-1}\dfrac{(1+x)}{(1-x)}$ (b) $\tan^{-1}\dfrac{(1-x)}{(1+x)}$

(c) $\log\dfrac{(1+x)}{(1-x)}$ (d) none of these

10. $\int\dfrac{dx}{x(x^n+1)}$ is equal to :

(a) $n\log\dfrac{x^n}{x^n+1}+c$ (b) $n\log\dfrac{x^n+1}{x^n}+c$

(c) $\dfrac{1}{n}\log\dfrac{x^n}{x^n+1}+c$ (d) $\dfrac{1}{n}\log\dfrac{x^n+1}{x^n}+c$

11. $\int\{1+2\tan x(\tan x+\sec x)\}^{1/2}dx$ is equal to :

(a) $\log(\sec x+\tan x)+c$

(b) $\log(\sec x+\tan x)^{1/2}+c$

(c) $\log\sec x(\sec x+\tan x)+c$

(d) none of the above

12. The value of $\int_0^{\pi/2}\dfrac{\cos\theta}{\sqrt{4-\sin^2\theta}}d\theta$ is :

(a) $\dfrac{\pi}{2}$ (b) $\dfrac{\pi}{6}$

(c) $\dfrac{\pi}{3}$ (d) $\dfrac{\pi}{5}$

13. If the ordinate $x=a$ divides the area bounded by the curve $y=\left(1+\dfrac{8}{x^2}\right)$, x-axis and the ordinates $x=2$, $x=4$, into two equal parts, then the value of a is :

(a) $2a$ (b) $2\sqrt{2}$

(c) $\dfrac{a}{2}$ (d) none of these

(a) $\frac{1}{\sqrt{5}}$ (b) $\frac{1}{\sqrt{2}}$

(c) $\sqrt{3}$ (d) $\sqrt{\frac{5}{3}}$

31. If x is real, then the value of $\frac{x+2}{2x^2+3x+6}$ is equal to :

(a) $\left(\frac{1}{13}, \frac{1}{3}\right)$ (b) $\left[-\frac{1}{13}, \frac{1}{3}\right]$

(c) $\left(-\frac{1}{3}, \frac{1}{13}\right)$ (d) none of these

32. Let α and β be the roots of the equation $x^2 + x + 1 = 0$, then the equation whose roots are α^{19}, β^7 is :

(a) $x^2 - x - 1 = 0$ (b) $x^2 - x + 1 = 0$

(c) $x^2 + x - 1 = 0$ (d) $x^2 + x + 1 = 0$

33. For a particle moving in a straight line, if time t be regarded as a function of velocity v, then the rate of change of the acceleration a is given by :

(a) $a^2 \frac{d^2t}{dv^2}$ (b) $a^3 \frac{d^2t}{dv^2}$

(c) $-a^3 \frac{d^2t}{dv^2}$ (d) none of these

34. ${}^{47}C_4 + \sum_{r=1}^{5} {}^{52-r}C_3$ is equal to :

(a) ${}^{47}C_6$ (b) ${}^{52}C_5$

(c) ${}^{52}C_4$ (d) none of these

35. In how many ways can 21 English and 19 Hindi books be placed in a row so that no two Hindi books are together :

(a) 1540 (b) 1450

(c) 1504 (d) 1405

36. How many words can be made from the letters of the word COMMITTEE :

(a) $\frac{9!}{(2!)^2}$ (b) $\frac{9!}{(2!)^3}$

(c) $\frac{9!}{2!}$ (d) 9!

37. Three forces P, Q, and R acting on a particle are in equilibrium. If the angle between P and Q is double the angle between P and R, then P is equal to :

(a) $\frac{Q^2+R^2}{R}$ (b) $\frac{Q^2-R^2}{Q}$

(c) $\frac{Q^2-R^2}{R}$ (d) $\frac{Q^2+R^2}{Q}$

38. If n is an integer greater than 1, then $a - {}^nC_1(a-1) + {}^nC_2(a-2) - \ldots + (-1)^n(a-n)$ is equal to :

(a) a (b) 0

(c) a^2 (d) 2^n

39. Forces forming a couple are of magnitude 12N each and the arm of the couple is 8m. The force of an equivalent couple whose arm is 6 m is of magnitude :

(a) 8 N (b) 16 N

(c) 12N (d) 4 N

40. In the expansion of

$2\log_e x - \log_e(x+1) - \log_e(x-1)$

the coefficient of x^{-4} is :

(a) $\frac{1}{2}$ (b) -1

(c) 1 (d) none of these

41. A tower subtends an angle α at a point in the plane of its base and the angle of depression of the foot of the tower at a point b ft just above A is β. Then height of the tower is :

(a) $b \tan\alpha \cot\beta$ (b) $b \cot\alpha \tan\beta$

(c) $b \tan\alpha \tan\beta$ (d) $b \cot\alpha \cot\beta$

42. The matrix $\begin{bmatrix} 2 & 5 & -7 \\ 0 & 3 & 11 \\ 0 & 0 & 9 \end{bmatrix}$ is known as :

(a) symmetric matrix

(b) upper triangular matrix

(c) diagonal matrix

(d) skew-symmetric matrix

43. Two bodies of different masses m_1 and m_2 are dropped from different heights h_1 and h_2. The ratio of the times taken by the two bodies to fall through these distance is :

(a) $h_1 : h_2$ (b) $\sqrt{h_1} : \sqrt{h_2}$

(c) $h_1^2 : h_2^2$ (d) $h_2 : h_1$

44. Matrix A is such that $A^2 = 2A - I$, where I is the identity matrix, then for $n \geq 2$, A^n is equal to :

(a) $nA - (n-1)I$

(b) $nA - I$

(c) $2^{n-1}A - (n-1)I$

(d) $2^{n-1}A - I$

45. The value of the determinant

$$\begin{vmatrix} x & a & b+c \\ x & b & c+a \\ x & c & a+b \end{vmatrix} = 0 \text{ if :}$$

(a) $x = a$ (b) $x = b$

(c) $x = c$ (d) x has any value

46. $\sin 12° \sin 48° \sin 54°$ is equal to :

(a) 1/16 (b) 1/32

(c) 1/8 (d) 1/4

47. If $\tan A = \dfrac{1 - \cos B}{\sin B}$, then :

(a) $\tan 2A = \tan B$

(b) $\tan 2A = \tan^2 B$

(c) $\tan 2A = \tan^2 B + 2 \tan B$

(d) none of the above

48. Three points are $A(6, 3)$, $B(-3, 5)$, $C(4, -2)$ and $P(x, y)$ is any point, then the ratio of area of ΔPBC and ΔABC is :

(a) $\dfrac{x + y - 2}{7}$ (b) $\dfrac{x - y + 2}{2}$

(c) $\dfrac{x - y - 2}{7}$ (d) none of these

49. The circle $x^2 + y^2 + 4x - 4y + 4 = 0$ touches :

(a) x-axis

(b) y-axis

(c) x-axis and y-axis

(d) none of the above

50. Three normals to the parabola $y^2 = x$ are drawn a point $(c, 0)$, then :

(a) $c = \dfrac{1}{4}$ (b) $c = \dfrac{1}{2}$

(c) $c > \dfrac{1}{2}$ (d) none of these

Answer – Key

1. c	**2.** a	**3.** b	**4.** b	**5.** b	**6.** b	**7.** a	**8.** c	**9.** b	**10.** c
11. c	**12.** b	**13.** b	**14.** d	**15.** b	**16.** a	**17.** b	**18.** c	**19.** c	**20.** c
21. b	**22.** b	**23.** b	**24.** a	**25.** b	**26.** b	**27.** b	**28.** a	**29.** b	**30.** d
31. b	**32.** d	**33.** c	**34.** c	**35.** a	**36.** b	**37.** b	**38.** b	**39.** b	**40.** a
41. a	**42.** b	**43.** b	**44.** a	**45.** d	**46.** c	**47.** a	**48.** a	**49.** c	**50.** c