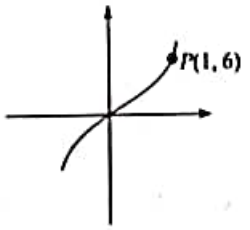
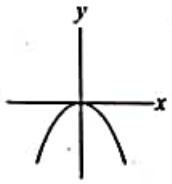
12. If the equation of the graph given below is $y = 6x^3$, then the value of the slope of the graph at (1, 6) is

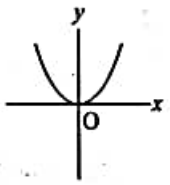


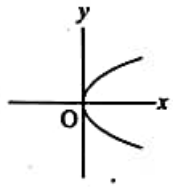
(1) 18 (2) $\frac{1}{18}$

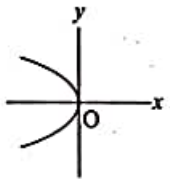
(3) $\frac{1}{4}$ (4) 2

13. The curve $y = -4x^2$ is best represented by

(1) 

(2) 

(3) 

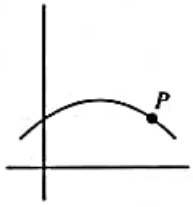
(4) 

14. The product of roots of quadratic equation $7x^2 - 10x + 3 = 0$ is

(1) 7/3 (2) 3/7

(3) 11/7 (4) −11/7

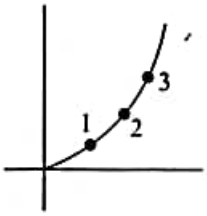
15. At point P, the value of $\frac{dy}{dx}$ is



(1) zero (2) positive

(3) negative (4) infinite

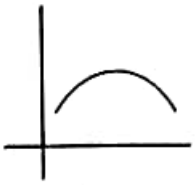
16. If the slope of graph (as shown in figure) at points 1, 2 and 3 are M_1, M_2, M_3, respectively, then



(1) $M_1 > M_2 > M_3$ (2) $M_1 < M_2 < M_3$

(3) $M_1 = M_2 = M_3$ (4) $M_1 = M_3 > M_2$

17. Magnitude of the slope of graph shown below



(1) first increases and then decreases

(2) first decreases and then increases

(3) increases

(4) decreases

Trigonometry

18. Convert 18 degree into radians.

(1) $\frac{\pi}{10}$ rad (2) $\frac{\pi}{180}$ rad

(3) $\frac{\pi}{18}$ rad (4) $\frac{18}{\pi}$ rad

19. Value of sin (37°) cos (53°) is

(1) $\frac{9}{25}$ (2) $\frac{12}{25}$

(3) $\frac{16}{25}$ (4) $\frac{3}{5}$

20. If $\sin\theta = \frac{1}{3}$, then $\cos\theta$ will be

(1) $\frac{8}{9}$ (2) $\frac{4}{3}$

(3) $\frac{2\sqrt{2}}{3}$ (4) $\frac{3}{4}$

21. $\sin(90° + \theta)$ is

(1) $\sin\theta$ (2) $\cos\theta$

(3) $-\cos\theta$ (4) $-\sin\theta$

22. $\cos(30°)$ is equal to

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{1}{2}$

(3) $\frac{1}{\sqrt{2}}$ (4) none of these

23. Find the value of sin 150°.

(1) $\frac{1}{2}$ (2) $\frac{\sqrt{3}}{2}$

(3) $\frac{1}{\sqrt{2}}$ (4) 0

24. If $A = 60°$, then the value of $\sin 2A$ will be

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{2}{\sqrt{3}}$

(3) $\frac{1}{2}$ (4) 1

25. Which of the following is correct for tan 225°?

(1) −1 (2) 1
(3) 0 (4) None of these

26. Which of the following does not have value 1?

(1) tan 45° (2) sin 90°
(3) cos 90° (4) cos 0°

27. Which of the following does not have value zero?

(1) sin 0° (2) tan 0°
(3) cos 90° (4) cot 0°

28. What is the value of cosec 330°?

(1) −2 (2) $-\frac{1}{2}$

(3) 2 (4) $+\frac{1}{2}$

29. cos (90° + θ) is equal to

(1) sin θ (2) ± sin θ

(3) ∓sin θ (4) − sin θ

30. cos 75° is equal to

(1) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ (2) $\frac{\sqrt{3}-1}{2\sqrt{2}}$

(3) $\frac{\sqrt{3}}{2}$ (4) $\sqrt{3}$

31. The value of $\sin(-1125°)$ is

(1) $+\frac{1}{\sqrt{2}}$ (2) $-\frac{1}{\sqrt{2}}$

(3) −1 (4) $+\frac{\sqrt{3}}{2}$

Differentiation

32. If $y = \ln(\ln x)$, then dy/dx is equal to

(1) $\frac{1}{x \ln x}$ (2) $\frac{1}{x}$

(3) $\frac{1}{\ln x}$ (4) e^x

33. If $x = a\cos t$, $y = b\sin t$, then $\frac{dy}{dx}$ is equal to

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

(3) $-\frac{a}{b}\cot t$ (4) $-\frac{a}{b}\tan t$

34. If $f(x) = x^2 - 6x + 8$, where $2 \le x \le 4$, then the value of x for which $f'(x)$ vanishes is

(1) 9/4 (2) 5/2
(3) 3 (4) 7/2

35. If $y = \sqrt{\frac{1-x}{1+x}}$, then $\frac{dy}{dx}$ is equal to

(1) $\frac{y}{x^2-1}$ (2) $\frac{y}{1-x^2}$

(3) $\frac{y}{1+x^2}$ (4) $\frac{y}{y^2-1}$

36. If $y = \sin x + \cos 2x$, then $\frac{d^2y}{dx^2}$ is equal to

(1) $\sin x + 4\sin 2x$ (2) $-\sin x + 4\cos 2x$
(3) $-(\sin x + 4\cos 2x)$ (4) none of these

37. Find $\frac{d}{dt}(\sin t^2)$.

(1) $2t\cos t^2$ (2) $t\cos t^2$
(3) $\cos t^2$ (4) none of these

38. Find $\frac{d}{dt}(e^{\sin t})$.

(1) $e^{\sin t}$ (2) $e^{\sin t}\cos t$
(3) $e^{\cos t}$ (4) $e^{\cos t.\sin t}$

39. If $y = \sin(x) + \ln(x^2) + e^{2x}$, then $\frac{dy}{dx}$ will be

(1) $\cos x + \frac{2}{x} + e^{2x}$ (2) $\cos x + \frac{2}{x} + 2e^{2x}$

(3) $-\cos x + \frac{2}{x} + e^{2x}$ (4) $-\cos x - \frac{2}{x^2} + 2e^{2x}$

40. For $x > 0$, $\frac{d}{dx}(\log \tan x)$ is

(1) 2 sec 2x (2) 2 cosec 2x
(3) sec 2x (4) cosec 2x

41. If $y = 2\sin x$, then dy/dx will be

(1) $2\cos x$ (2) $-2\cos x$
(3) $\cos x$ (4) none of these

42. If $y = x^3 + 2x^2 + 7x + 8$, then $\frac{dy}{dx}$ will be

(1) $3x^2 + 2x + 15$ (2) $3x^2 + 4x + 7$
(3) $x^3 + 2x^2 + 15$ (4) $x^3 + 4x + 7$

43. If $y = 2 \sin(\omega t + \phi)$, where ω and ϕ constants, then dy/dt will be

(1) $2\omega \cos(\omega t + \phi)$ (2) $-2\omega \cos(\omega t + \phi)$
(3) $2 \sin(\omega t + \phi)$ (4) $2\omega \sin(\omega t + \phi)$

44. If $y = \frac{1}{x^4}$, then $\frac{dy}{dx}$ will be

(1) $\frac{4}{x^3}$ (2) $4x^3$

(3) $-\frac{4}{x^5}$ (4) $\frac{4}{x^5}$

45. If $y = \sin x$ and $x = 3t$, then $\frac{dy}{dt}$ will be

(1) $3 \cos(x)$ (2) $\cos x$
(3) $3 \cos(3t)$ (4) $-\cos x$

46. If $y = \frac{\ln x}{x}$, then $\frac{dy}{dx}$ will be

(1) $\frac{1-\ln x}{x}$ (2) $\frac{1+\ln x}{x^2}$

(3) $\frac{1-\ln x}{x^2}$ (4) $\frac{\ln x - 1}{x^2}$

47. If $y = x^2 \sin x$, then $\frac{dy}{dx}$ will be

(1) $x^2 \cos x + 2x \sin x$ (2) $2x \sin x$
(3) $x^2 \cos x$ (4) $2x \cos x$

48. If $\alpha = \sec(3\beta)$, then $\frac{d\alpha}{d\beta}$ will be

(1) $3 \sec^2(3\beta) \tan(3\beta)$ (2) $3\alpha^2 \sin(3\beta)$
(3) $\sec(3\beta) \tan(3\beta)$ (4) $3 \sec^2(3\beta)$

49. If velocity of particle is given by $v = 2t^4$, then its acceleration (dv/dt) at any time t will be given by

(1) $8t^3$ (2) $8t$
(3) $-8t^3$ (4) t^2

50. Differentiation of $2x^2 + 3x$ w.r.t. x is

(1) $4x + 3$ (2) $4x$
(3) 3 (4) $4x + 1$

51. If $y = e^x \cdot \cot x$, then $\frac{dy}{dx}$ will be

(1) $e^x \cot x - \operatorname{cosec}^2 x$ (2) $e^x \operatorname{cosec}^2 x$
(3) $e^x(\cot x - \operatorname{cosec}^2 x)$ (4) $e^x \cot$

52. If $y = \tan x \cdot \cos^2 x$, then $\frac{dy}{dx}$ will be

(1) $1 + 2\sin^2 x$ (2) $1 - 2\sin^2 x$
(3) 1 (4) $2 \sin^2 x$

53. If $y = 2 \sin^2 \theta + \tan \theta$, then $\frac{dy}{d\theta}$ will be

(1) $4 \sin \theta \cos \theta + \sec \theta \tan \theta$
(2) $2 \sin 2\theta + \sec^2 \theta$
(3) $4 \sin \theta + \sec^2 \theta$
(4) $2 \cos^2 \theta + \sec^2 \theta$

54. $\frac{d}{dx} \log(\sec x)$ is equal to

(1) $\frac{1}{\sec x}$ (2) $\frac{1}{\sec x \cdot \tan x}$
(3) $\tan x$ (4) none of these

55. $\frac{d}{dx}(\sin x \log x)$ is equal to

(1) $\frac{\sin x}{x} + \cos x \cdot \log x$ (2) $\frac{\cos x}{x} + \cos x \cdot \log x$
(3) $\frac{\sin x}{x} - \cos x \cdot \log x$ (4) $\frac{\cos x}{x} - \cos x \cdot \log x$

56. Find $\frac{d}{dx}(\tan^2 x)$.

(1) $\tan 2x$ (2) $2 \tan x \sec^2 x$
(3) $2 \tan x \sec x$ (4) None of these

57. $\frac{d}{dx}(\sin^2 x)$ is equal to

(1) $\sin 2x$ (2) $2 \sin x$
(3) $2 \cos x$ (4) none of these

58. Which of the following statements is incorrect?

(1) $\frac{d}{dx}(x^2+2)^2 = 4x$

(2) $\frac{d}{dx}(e^{-2x}) = -2e^{-2x}$

(3) $\frac{d}{dx}\{\sin(ax+b)\} = a\cos(ax+b)$

(4) $\frac{d}{dx}(x^3+3x+1)^2 = 2(3x^2+3)(x^3+3x+1)$

59. The slope of the tangent to the curve $y = \ln(\cos x)$ at $x = \frac{3\pi}{4}$ is

(1) 1 (2) -1
(3) $\ln\sqrt{2}$ (4) $\frac{1}{\sqrt{2}}$

60. A stone is dropped into a quiet lake and waves move in circles at the speed of 5 cm/s. At the instant when the radius of the circular wave is 8 cm, how fast is the enclosed area increasing?
(1) 80π cm²/s (2) 90π cm²/s
(3) 85π cm²/s (4) 89π cm²/s

61. The momentum of a moving particle given by $p = t \ln t$. Net force acting on this particle is defined by the equation $F = \frac{dp}{dt}$. The net force acting on the particle is zero at time
(1) $t = 0$ (2) $t = \frac{1}{e}$
(3) $t = \frac{1}{e^2}$ (4) none of these

62. An edge of a variable cube is increasing at the rate of 3 cm/s. How fast is the volume of the cube increasing when the edge is 10 cm long?
(1) 900 cm³/s (2) 920 cm³/s
(3) 850 cm³/s (4) 950 cm³/s

63. A metal ring is being heated so that at any instant of time t (in seconds), its area is given by
$$A = \left(3t^2 + \frac{t}{3} + 2\right) \text{m}^2$$
What will be the rate of increase of area at $t = 10$ s?
(1) (160/30) m²/s (2) (181/3) m²/s
(3) (181/30) m²/s (4) (160/3) m²/s

64. If the volume of a sphere increases at constant rate $\frac{dV}{dt} = 4$. If radius of the sphere is denoted by r, the surface area of the sphere increases at the rate
(1) $\frac{4}{r}$ (2) $\frac{8}{r}$
(3) $\frac{12}{r}$ (4) $\frac{16}{r}$

65. If surface area of a cube is changing at a rate of 5 units, then the rate of change of body diagonal at the moment when side length is 1m is (All given quantities are in SI units)
(1) $\frac{5}{4\sqrt{3}}$ units (2) $\frac{4}{\sqrt{3}}$ units
(3) $\frac{5}{\sqrt{3}}$ units (4) none of these

66. Water pours out at the rate of Q from a tap, into a cylindrical vessel of radius r. The rate at which the height of water level rises when the height is h, is
(1) $\frac{Q}{\pi r h}$ (2) $\frac{Q}{\pi r^2}$
(3) $\frac{Q}{2\pi r^2}$ (4) $\frac{Q}{\pi r^2 h}$

67. Given a function $y = x^2 - 2\sqrt{x}$. What is the rate of change in y with respect to x when $x = 1$?
(1) Zero (2) 1
(3) 1.5 (4) −1.5

Maxima and Minima

68. If $y = x^3 - 6x^2 + 9x + 15$, then
(1) local maximum is at $x = 1$ and local maxir = 19
(2) local minimum is at $x = 3$ and local minin = 12
(3) local maximum is at $x = 1$ and local maximum value = 13
(4) local minimum is at $x = 3$ and local minimum value = 15

69. If $f(x) = x^2 - 2x + 4$, then $f(x)$ has
(1) a minimum at $x = 1$ (2) a maximum at $x = 1$
(3) no extreme point (4) a minimum at $x = -1$

70. The maximum and minimum values of $y = x + \frac{1}{x}$ in the interval $\left[\frac{1}{3}, \frac{4}{3}\right]$ are, repetitively,
(1) 2, −2 (2) $\frac{10}{3}$, 2
(3) $\infty, -\infty$ (4) none of these

71. If $Q = 4V^3 + 3V^2$, then the value of point of maxima is
(1) 0 (2) $-\frac{1}{2}$
(3) $\frac{1}{2}$ (4) none of these

72. If $y = 3t^2 - 4t$, then minima of y will be at
(1) 3/2 (2) 3/4
(3) 2/3 (4) 4/3

73. The maximum value of xy subject to $x + y = 8$, is
(1) 8 (2) 16
(3) 20 (4) 24

74. Maximum value of $f(x) = (\sin x + \cos x)$ is
(1) 1 (2) 2
(3) $\frac{1}{\sqrt{2}}$ (4) $\sqrt{2}$

75. The maximum vlaue of $7 + 6x - 9x^2$ is
(1) 8 (2) −8
(3) 4 (4) −4

76. Maximum value of y when $y = (100 - x^2 + 2x)$ is

(1) 100 (2) 99
(3) 101 (4) 102

77. Find maximum value of y when $y = 3 \sin 0 + 4 \cos 0$.

(1) 7 (2) 1
(3) 5 (4) 25

Integration

78. $\int (2x+1)^3\, dx$ is equal to

(1) $-\frac{(2x+1)^4}{8}+C$ (2) $\frac{(2x+1)^4}{8}+C$
(3) $3(2x+1)+C$ (4) none of these

79. $\int \cos(3z+4)\, dz$ is equal to

(1) $\frac{2}{3}\sin(3z+4)+C$ (2) $\sin(3z+4)+C$
(3) $\frac{1}{3}\sin(3z+4)+C$ (4) none of these

80. $\int \sin(8z-5)\, dz$ is equal to

(1) $\frac{\cos(8z-5)}{8}+C$ (2) $-\frac{\cos(8z-5)}{8}+C$
(3) $\cos(8z-5)+C$ (4) none of these

81. $\int_{-1}^{-1} \frac{\pi}{2}\, d\theta$ is equal to

(1) $\frac{3\pi}{2}$ (2) $\frac{\pi}{2}$
(3) $\frac{5\pi}{2}$ (4) none of these

82. $\int_{-2}^{4} \left(\frac{x}{2}+3\right) dx$ is equal to

(1) 16 (2) 18
(3) 29 (4) 21

83. Find $\int \sec^2 2x\, dx$.

(1) $\tan 2x + C$ (2) $\frac{\tan 2x}{2}+C$
(3) $\tan^2 2x + C$ (4) none of these

84. $\int \sqrt[4]{x^5}\, dx$ is equal to

(1) $\frac{4x^{-9/4}}{9}+C$ (2) $\frac{4x^{9/4}}{9}+C$
(3) $\frac{4x^{1/5}}{9}+C$ (4) $\frac{4x^{-1/5}}{9}+C$

85. Find the area of the region between the given curve $y = 3x^2$ and the x-axis in the interval $[0, b]$.

(1) b^3 (2) b^2
(3) b^4 (4) none of these

86. If $y = \sin(2x+3)$, then $\int y\, dx$ will be

(1) $\frac{\cos(2x+3)}{2}+C$ (2) $-\frac{\cos(2x+3)}{2}+C$
(3) $-\cos(2x+3)+C$ (4) $-2\cos(2x+3)+C$

87. $\int \sqrt[5]{x^2}\, dx$ is equal to

(1) $\frac{5}{7}x^{\frac{7}{5}}+C$ (2) $\frac{7}{5}x^{\frac{7}{5}}+C$
(3) $-\frac{7}{5}x^{\frac{7}{5}}+C$ (4) $-\frac{5}{7}x^{-\frac{7}{5}}+C$

88. $\int \left(e^x + \frac{1}{x}\right) dx$ is equal to

(1) $e^x - \frac{1}{x^2}$ (2) e^x
(3) $e^x - \log x$ (4) $e^x + \log$

6/13

89. $\int x \ln x\, dx$ is equal to

(1) $\frac{x^2}{2}\ln x - \frac{x^2}{4}+C$ (2) $\frac{x^2}{2}\ln x + C$
(3) $xe^x + C$ (4) $\frac{x}{2}+C$

90. Value of $\int_0^1 \frac{1}{(3-2x)^2}\, dx$ is

(1) $-\frac{1}{9}$ (2) $-\frac{2}{9}$
(3) $-\frac{4}{9}$ (4) none of these

91. $\int_0^2 2t\, dt$ is equal to

(1) 0 (2) 4
(3) 2 (4) $\frac{1}{2}$

92. Value of $\int_0^1 \sin 60^\circ\, dx$ is

(1) 1 (2) $\frac{\sqrt{3}}{2}$
(3) $\frac{3}{2}$ (4) none of these

93. Value of $\int_0^1 (x^3+1)dx$ is

(1) $\frac{1}{4}$ (2) $\frac{3}{4}$

(3) $\frac{5}{4}$ (4) $\frac{7}{4}$

94. Value of $\int_1^2 (x^3+x^2-2x+1)\,dx$ is

(1) $\frac{45}{12}$ (2) $\frac{49}{12}$

(3) $\frac{55}{12}$ (4) $\frac{33}{12}$

95. $\int_0^{\pi/4} \sec^2 x\,dx$ is

(1) 1 (2) 2
(3) 3 (4) 4

96. $\int_{\pi/6}^{\pi/2} \sin x\,dx$ is equal to

(1) $\frac{1}{2}$ (2) $\frac{1}{\sqrt{2}}$

(3) $\frac{\sqrt{3}}{2}$ (4) 0

97. $\int(4\cos t+t^2)dt$ is equal to

(1) $-4\sin t+\frac{t^3}{3}+C$ (2) $-4\sin t+t^2+C$

(3) $4\sin t+\frac{t^3}{3}+C$ (4) $4\sin t+2t^3+C$

98. Value of $\int_0^1 (3x^2-4x+1)dx$ is

(1) 0 (2) 1
(3) 2 (4) 3

99. Value of $\int_2^4 \frac{dx}{x}$ is

(1) $3\log_e 2$ (2) $\log_e 2$
(3) $\log_e 4$ (4) $2\log_e 8$

100. Value of $\int_{\pi/2}^{+\pi/2} (3\sin 2x)dx$ is

(1) 0 (2) 2
(3) –2 (4) π

ANSWER KEYS

1. (2)	2. (2)	3. (2)	4. (2)	5. (3)	6. (2)	7. (1)	8. (3)	9. (1)	10. (1)
11. (1)	12. (1)	13. (1)	14. (2)	15. (2)	16. (3)	17. (2)	18. (1)	19. (1)	20. (3)
21. (2)	22. (1)	23. (1)	24. (1)	25. (2)	26. (3)	27. (4)	28. (1)	29. (3)	30. (2)
31. (2)	32. (1)	33. (2)	34. (3)	35. (1)	36. (3)	37. (1)	38. (2)	39. (2)	40. (2)
41. (1)	42. (2)	43. (1)	44. (3)	45. (3)	46. (3)	47. (1)	48. (2)	49. (1)	50. (1)
51. (3)	52. (2)	53. (2)	54. (3)	55. (1)	56. (2)	57. (1)	58. (1)	59. (1)	60. (1)
61. (2)	62. (1)	63. (2)	64. (2)	65. (1)	66. (2)	67. (2)	68. (1)	69. (1)	70. (2)
71. (2)	72. (3)	73. (2)	74. (4)	75. (1)	76. (3)	77. (3)	78. (2)	79. (3)	80. (2)
81. (1)	82. (4)	83. (2)	84. (2)	85. (1)	86. (2)	87. (1)	88. (4)	89. (1)	90. (4)
91. (2)	92. (2)	93. (3)	94. (2)	95. (1)	96. (3)	97. (3)	98. (1)	99. (2)	100. (1)