CHAPTER TEST

Each of the following questions has four choices (a), (b), (c) and (d) out of which only one is correct. Mark the correct choice.

1. The abscissa of the point on the curve $ay^2 = x^3$, the normal at which cuts off equal intercepts from the coordinate axes is
(a) $2a/9$ (b) $4a/9$ (c) $-4a/9$ (d) $-2a/9$

2. If the curves $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and $\frac{x^2}{l^2} - \frac{y^2}{m^2} = 1$ cut each other orthogonally, then
(a) $a^2 + b^2 = l^2 + m^2$ (b) $a^2 - b^2 = l^2 - m^2$
(c) $a^2 - b^2 = l^2 + m^2$ (d) $a^2 + b^2 = l^2 - m^2$

3. The length of the normal at any point on the catenary $y = c \cos h\left(\frac{x}{c}\right)$ varies as
(a) (abscissa)^2 (b) (ordinate)^2
(c) abscissa (d) ordinate

4. If the subnormal at any point on $y = a^{1-n} x^n$ is of constant length, then the value of n, is
(a) 1 (b) 1/2 (c) 2 (d) -2

5. The angle of intersection of the curves $y = x^2$, $6y = 7 - x^3$ at (1, 1) is
(a) $\pi/4$ (b) $\pi/3$
(c) $\pi/2$ (d) none of these

6. The slope of the tangent to the curve $x = t^2 + 3t - 8$, $y = 2t^2 - 2t - 5$ at the point $(2, -1)$ is
(a) 22/7 (b) 6/7
(c) -6 (d) none of these

7. The two curves $x^3 - 3xy^2 + 2 = 0$ and $3x^2y - y^3 - 2 = 0$ intersect at an angle of
(a) 45° (b) 60° (c) 90° (d) 30°

8. The tangent and normal at the point $P(at^2, 2at)$ to the parabola $y^2 = 4ax$ meet the x-axis in T and G respectively, then the angle at which the tangent at P to the parabola is inclined to the tangent at P to the circle through T, P, G is
(a) $\tan^{-1} t^2$ (b) $\cot^{-1} t^2$
(c) $\tan^{-1} t$ (d) $\cot^{-1} t$

9. If $y = 4x - 5$ is a tangent to the curve $y^2 = px^3 + q$ at (2, 3), then
(a) $p = 2, q = -7$ (b) $p = -2, q = 7$
(c) $p = -2, q = -7$ (d) $p = 2, q = 7$
[IIT 1994]

10. The curve $y - e^{xy} + x = 0$ has a vertical tangent at the point
(a) (1, 1) (b) at no point
(c) (0, 1) (d) (1, 0)

11. If the parametric equation of a curve given by $x = e^t \cos t$, $y = e^t \sin t$, then the tangent to the curve at the point $t = \pi/4$ makes with axis of x the angle
(a) 0 (b) $\pi/4$ (c) $\pi/3$ (d) $\pi/2$

12. The length of the normal at t on the curve $x = a(t + \sin t)$, $y = a(1 - \cos t)$ is
(a) $a \sin t$ (b) $2a \sin^3 \frac{t}{2} \sec \frac{t}{2}$
(c) $2a \sin \frac{t}{2} \tan \frac{t}{2}$ (d) $2a \sin \frac{t}{2}$

13. For the parabola $y^2 = 4ax$, the ratio of the subtangent to the abscissa is
(a) 1 : 1 (b) 2 : 1 (c) $x : y$ (d) $x^2 : y$

14. The length of the subtangent to the curve $\sqrt{x} + \sqrt{y} = 3$ at the point (4, 1) is
(a) 2 (b) 1/2 (c) 3 (d) 4.

15. The normal to the curve $x = a(\cos\theta + \theta \sin\theta)$, $y = a(\sin\theta - \theta \cos\theta)$ at any point θ is such that
(a) it makes a constant angle with x-axis
(b) it passes through the origin
(c) it is at a constant distance from the origin
(d) none of these

16. Tangents are drawn from the origin to the curve $y = \cos x$. Their points of contact lie on
(a) $x^2y^2 = y^2 - x^2$ (b) $x^2y^2 = x^2 + y^2$
(c) $x^2y^2 = x^2 - y^2$ (d) none of these

17. If m denotes the slope of the normal to the curve $y = -3 \log(9 + x^2)$ at the point $x \neq 0$, then,
(a) $m \in [-1, 1]$ (b) $m \in R - (-1, 1)$
(c) $m \in R - [-1, 1]$ (d) $m \in (-1, 1)$

18. If m be the slope of the tangent to the curve $e^{2y} = 1 + 4x^2$, then
(a) $m < 1$ (b) $|m| \leq 1$
(c) $|m| > 1$ (d) none of these

19. If the curve $y = ax^3 + bx^2 + cx$ is inclined at 45° to x-axis at $(0, 0)$ but touches x-axis at $(1, 0)$, then
(a) $a = 1, b = -2, c = 1$ (b) $a = 1, b = 1, c = -2$
(c) $a = -2, b = 1, c = 1$ (d) $a = -1, b = 2, c = 1$

20. If the curve $y = ax^2 + bx + c$ passes through the point $(1, 2)$ and the line $y = x$ touches it at the origin, then
(a) $a = 1, b = -1, c = 0$ (b) $a = 1, b = 1, c = 0$
(c) $a = -1, b = 1, c = 0$ (d) none of these

21. The angle between the tangents to the curve $y^2 = 2ax$ at the point where $x = \frac{a}{2}$, is
(a) $\pi/6$ (b) $\pi/4$ (c) $\pi/3$ (d) $\pi/2$

22. The intercepts made by the tangent to the curve $y = \int_0^x |t|\,dt$, which is parallel to the line $y = 2x$, on y-axis are equal to
(a) 1, −1 (b) −2, 2 (c) 3 (d) −3

23. The line $\frac{x}{a} + \frac{y}{b} = 2$ touches the curve $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n = 2$ at the point (a, b) for
(a) $n = 2$ only (b) $n = -3$ only
(c) any $n \in R$ (d) none of these

24. The equation of the normal to the curve $y = e^{-2|x|}$ at the point where the curve cuts the line $x = 1/2$, is
(a) $2e(ex + 2y) = e^2 - 4$ (b) $2e(ex - 2y) = e^2 - 4$
(c) $2e(ey - 2x) = e^2 - 4$ (d) none of these

25. The length of the subtangent to the curve $x^2 + xy + y^2 = 7$ at $(1, -3)$ is
(a) 3 (b) 5 (c) 15 (d) 3/5
[CEE (Delhi) 2004]

Answers

1. (b) 2. (c) 3. (b) 4. (b) 5. (c) 6. (b) 7. (c) 8. (c) 9. (a) 10. (d) 11. (d) 12. (c) 13. (b) 14. (b) 15. (c) 16. (c) 17. (b) 18. (b) 19. (a) 20. (b) 21. (d) 22. (b) 23. (c) 24. (b) 25. (c)

Solutions of Exercises and **Chapter-tests** are available in a separate book on **"Solutions of Objective Mathematics".**