doubtnut
India's Number 1 Education App

MATHS

BOOKS - CHHAYA PUBLICATION MATHS (BENGALI ENGLISH)

MCQ ZONE 3

Question Paper 1

1. The area (in square unit) of the region bounded by the curve $x^2 = 4y$, the line $x = 2$

and x- axis is -

A. 1

B. $\frac{2}{3}$

C. $\frac{4}{3}$

D. $\frac{8}{3}$

Answer: B

Watch Video Solution

2. Let $P(a\sec\theta, b\tan\theta)$ and $Q(a\sec\phi, b\tan\phi)$ where $\theta+\phi=\frac{\pi}{2}$ be two point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ .If (h, k) be the point of intersection of the normals at P and Q , then the value of k is -

A. $\frac{a^2 + b^2}{a}$

B. $-\frac{a^2 + b^2}{a}$

C. $\frac{a^2 + b^2}{b}$

D. $-\frac{a^2 + b^2}{b}$

Answer: D

Watch Video Solution

3. The equation of the tangent to the curve $(1+x^2)y=2-x$ where it crosses the x -axis is-

A. x + 5y = 2

B. x - 5y = 2

C. 5y - y = 2

D. 5x + y = 2

Answer: A

Watch Video Solution

4. The area (in square unit) bounded by the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is -

A. $\frac{64a^2}{3}$

B. $\frac{32a^2}{3}$

C. $\frac{16a^2}{3}$

D. $\frac{8a^2}{3}$

Answer: C

Watch Video Solution

5. Equations of the tangent and the normal drawn at the point (6, 0) on the ellipse $\frac{x^2}{36} + \frac{y^2}{9} = 1$ respectively are-

A. $x = 6, y = 0$

B. $x + y = 6, y - x + 6 = 0$

C. $x = 0, y = 3$

D. $x = -6, y = 0$

Answer: A

Watch Video Solution

6. The are (in square unit) of the figure bounded by the curves $y=\cos x$ and $y=\sin x$ and the ordinates $x=0, x=\frac{\pi}{4}$ is-

A. $\sqrt{2}+1$

B. $\sqrt{2}-1$

C. $\frac{1}{\sqrt{2}}$

D. $\frac{\sqrt{2}-1}{\sqrt{2}}$

Answer: B

Watch Video Solution

7. The straight line $x + y = a$ will be a tangent to the ellipse $\frac{x^2}{9} + \frac{y^2}{16} = 1$ if the value of a is -

A. 8

B. ± 10

C. ± 5

D. ± 6

Answer: C

Watch Video Solution

8. The equation of the tangent to the parabola $y^2 = 8x$ which is perpendicular to the line $x - 3y + 8 = 0$ is -

A. $3x + y + 2 = 0$

B. $3x - y - 1 = 0$

C. $9x - 3y + 2 = 0$

D. $9x + 3y + 2 = 0$

Answer: D

Watch Video Solution

9. The area (in square unit) bounded by the parabola $y^2 = 8x$ and its latus rectum is -

A. $\frac{16}{3}$

B. $\frac{25}{3}$

C. $\frac{16\sqrt{2}}{3}$

D. $\frac{32}{3}$

Answer: D

Watch Video Solution

10. If the curves $y^2 = 4x$ and $xy = k$ cut orthogonally, then the value of k^2 will be-

A. 16

B. 32

C. 36

D. 8

Answer: B

Watch Video Solution

11. Find the area bounded by the curve $x^2 = 4y$ and the line x = 4y - 2.

A. $\frac{8}{3}$

B. $\frac{3}{8}$

C. 8

D. 3

Answer: C

Watch Video Solution

12. If the slope of the normal to the curve $x^3 = 8a^2y$ at P is $\left(\frac{-2}{3}\right)$, then the coordinates of P are-

A. $(2a, a)$

B. (a, a)

C. $(2a, \; -a)$

D. none of these

Answer: A

Watch Video Solution

13. If $a > 2b > 0$, then the positive value of m for which the line $y = mx - b\sqrt{1 + m^2}$ is a common tangent to the circles $x^2 + y^2 = b^2$ and $(x - a)^2 + y^2 = b^2$ is-

A. $\dfrac{2b}{\sqrt{a^2 - 4b^2}}$

B. $\dfrac{\sqrt{a^2 - 4b^2}}{2b}$

C. $\dfrac{2b}{a - 2b}$

D. $\dfrac{b}{a - 2b}$

Answer: A

Watch Video Solution

14. The area (in square unit) of the region bounded by the line $y=|x-1|$ and $y=3-|x|$ is -

A. 6

B. 2

C. 4

D. 3

Answer: C

Watch Video Solution

15. The minimum value of $f(x) = x^2 + \frac{250}{x}$ is-

A. 55

B. 25

C. 50

D. 75

Answer: D

Watch Video Solution

16. If $f(x) = kx^3 - 9x^2 + 9x + 3$ is an increasing function then-

A. $k < 3$

B. $k \leq 3$

C. $k > 3$

D. k is indeterminate

Answer: C

Watch Video Solution

17. If $f(x)=\dfrac{1}{4x^2+2x+1}$ then its maximum value is -

A. $\dfrac{2}{3}$

B. $\dfrac{4}{3}$

C. $\dfrac{3}{4}$

D. 1

Answer: B

Watch Video Solution

18. If $f(x)=\frac{1}{x+1}-\log(1+x), x>0$ then f(x) is-

A. a decreasing function

B. an increasing function

C. neither increasing nor decreasing

D. increasing when $x>1$

Answer: A

Watch Video Solution

19. Let α, β be the roots of $x^2 + (3 - \lambda)x - \lambda = 0$, then the value of λ for which $\alpha^2 + \beta^2$ is minimum, is-

A. 0

B. 1

C. 3

D. 2

Answer: D

Watch Video Solution

20. The function $f(x) = 2x^3 - 3x^2 - 12x + 4$ has-

A. no maxima and minima

B. one maximum and one minimum

C. two maxima

D. two minima

Answer: B

Watch Video Solution

21. The height of the cylinder of maximum volume that can be inscribed in a sphere of radius a, is-

A. $\frac{3a}{2}$

B. $\frac{\sqrt{2}a}{3}$

C. $\frac{2a}{\sqrt{3}}$

D. $\frac{a}{\sqrt{3}}$

Answer: C

Watch Video Solution

22. Maximum value of $\frac{\log x}{x}$ in $[2, \infty)$ is-

A. $\frac{\log 2}{2}$

B. 0

C. $\frac{1}{e}$

D. e

Answer: C

Watch Video Solution

23. Let the function $f: R \to R$ be defined by $f(x) = 2x + \cos x$, then f(x)-

A. has maximum value at x=0

B. has minimum value at $x = \pi$

C. is a decreasing function

D. is an increasing function

Answer: D

Watch Video Solution

24. The maximum distance from the origin of a point on the curve $x = a\sin t - b\sin\left(\frac{at}{b}\right), y = a\cos t - b\cos\left(\frac{at}{b}\right)$, both $a, b > 0$, is-

A. $a - b$

B. $a + b$

C. $\sqrt{a^2 + b^2}$

D. $\sqrt{a^2 - b^2}$

Answer: B

Watch Video Solution

25. If the slope of the tangent line to the curve $y = \frac{6}{x^2 - 4x + 6}$ at some point on it is zero, then the equation of the tangent is-

A. $y = 3$

B. $2y - 1 = 0$

C. $y = 2$

D. $y + 3 = 0$

Answer: A

Watch Video Solution

26. If the slope of the tangent at (x, y) to a curve passing through the point $(2, 1)$ is $\frac{x^2 + y^2}{2xy}$, then the equation of the curve is-

A. $2(x^2 - y^2) = 3x$

B. $2(x^2 - y^2) = 3y$

C. $x(x^2 - y^2) = 6$

D. $x(x^2 + y^2) = 6$

Answer: A

Watch Video Solution

27. The region represented by the system of in

equations $y \leq 7, 2x + y \leq 4, x \geq 0, y \geq 0$ is

A. bounded in first and second quadrants

B. bounded in first quadrant

C. unbounded in first quadrant

D. none of these

Answer: B

Watch Video Solution

28. If the radius of a sphere is measured as 14 cm with an error of 0.03 cm , then approximate error in the calculation of its volume is-

A. $20.52\pi cm^3$

B. $18.96\pi cm^3$

C. $23.52\pi cm^3$

D. $24.96\pi cm^3$

Answer: C

Watch Video Solution

29. If $y = 3x^2 + 2$ and if x changes from 10 to 10.1 , then the approximate change in y will be-

A. 8

B. 6

C. 5

D. 4

Answer: B

Watch Video Solution

30. The rate of change of surface area of a sphere of radius r when the radius is increasing at the rate of 2 cm/s. is proportional to

A. $\frac{1}{r^2}$

B. r^2

C. r

D. $\frac{1}{r}$

Answer: C

Watch Video Solution

Question Paper 2

1. If the curves $y = a^x$ and $y = b^x$ intersect at an angle α, then the value of $\tan\alpha$ is-

A. $\dfrac{a-b}{1+ab}$

B. $\dfrac{\log a - \log b}{1+\log a \log b}$

C. $\dfrac{a+b}{1-ab}$

D. $\dfrac{\log a + \log b}{1+\log a \log b}$

Answer: B

Watch Video Solution

2. If the straight line $y = 4x - 5$ touches the curve $y^2 = px^3 + q$ at (2, 3), then the values of p and q are-

A. $p = 2, q = -7$

B. $p = 2, q = 7$

C. $p = -2, q = -7$

D. $p = -2, q = 7$

Answer: A

Watch Video Solution

3. The area (in square unit) of the figure bounded by $y^2 = 12x$, $x = 0$ and $y = 6$ is-

A. 12

B. 16

C. 3

D. 6

Answer: D

Watch Video Solution

4. The area (in square unit) of the region bounded by the curves $4x + 3y = 12$ is-

A. 6

B. 8

C. 4

D. 3

Answer: C

Watch Video Solution

5. The ratio of the areas bounded by the curves $y = \cos x$ and $y = \cos 2x$ between $x = 0, x = \frac{\pi}{3}$ and x-axis is-

A. $\sqrt{2} : 1$

B. $1 : 1$

C. $1 : 2$

D. $2 : 1$

Answer: D

Watch Video Solution

6. The equation of the normal to the parabola $y^2 = 4ax$ at the point $(at^2, 2at)$ is-

A. $tx + y = 2at + at^3$

B. $x + ty = 2at + at^3$

C. $tx - y = at + 2at^3$

D. $x - ty = at + 2at^3$

Answer: A

Watch Video Solution

7. If the slope of the normal to the parabola $3y^2 + 4y + 2 = x$ at a point on it is 8, then the coordinates of the point are-

A. $(1, \ -1)$

B. $(6, \ -2)$

C. $(9, 1)$

D. $(2, 0)$

Answer: B

Watch Video Solution

8. If the line $lx + my + n = 0$ is a tangent to the parabola $y^2 = 4ax$, then-

A. $an^2 = ml$

B. $al^2 = mn$

C. $am^2 = nl$

D. $a^2m = nl$

Answer: C

Watch Video Solution

9. The area (in square unit) in the first quadrant bounded by the parabolas $y^2 = 4x, y^2 = 16x$ and the straight line $x = 9$ is-

A. 36

B. 24

C. 18

D. 9

Answer: A

Watch Video Solution

10. The equations of the tangents to the hyperbola $3x^2 - 4y^2 = 12$ which are inclined at an angle 60° to the x- axis are-

A. $y = \sqrt{3}x \pm 12$

B. $y = \sqrt{3}x \pm 10$

C. $y = \sqrt{3}x \pm 15$

D. $y = \sqrt{3}x \pm 3$

Answer: D

Watch Video Solution

11. The equation of tangent to the curve $xy^2 = 4(4-x)$ where it meets the line $y = x$ is-

A. $x + y + 4 = 0$

B. $x + y = 4$

C. $x - y = 2$

D. $x - y + 2 = 0$

Answer: B

Watch Video Solution

12. The normal to the curve $x = 3\cos\theta - \cos^3\theta, y = 3\sin\theta - \sin^3\theta$ at $\theta = \frac{\pi}{4}$ -

A. is at a distance of 2 unit from the origin

B. is at a distance of 4 unit from the origin

C. passes through the origin

D. passes through the point(2,3)

Answer: C

Watch Video Solution

13. The area bounded by the parabolas $y = 4x^2, y = \frac{x^2}{9}$ and the straight line y = 2 is

A. $\frac{20}{3}$

B. $\frac{16}{3}$

C. 8

D. $\frac{32}{3}$

Answer: A

Watch Video Solution

14. The point on the curve $x^2 + 2y = 10$ at which the tangent to the curve is perpendicular to the line $2x - 4y = 7$, is-

A. $(2, 3)$

B. $(-2, 3)$

C. $(4, -3)$

D. $(-4, -3)$

Answer: A

Watch Video Solution

15. Let x and y be two variables and $x > 0, xy = 1$, then the minimum value of x+y is-

A. 1

B. $\frac{5}{2}$

C. $\frac{10}{3}$

D. 2

Answer: D

Watch Video Solution

16. The function $f(x) = 1 - x^3 - x^5$ is decreasing for -

A. $1 \leq x \leq 5$

B. all real values of x

C. $x \leq 3$

D. $x \geq 5$

Answer: B

Watch Video Solution

17. The function $y = a(1 - \cos x)$ is maximum when x is-

A. $\frac{\pi}{2}$

B. $-\frac{\pi}{2}$

C. π

D. $\frac{\pi}{3}$

Answer: C

Watch Video Solution

18. Let $f(x) = x^3 + 6x^2 + px + 2$, if the largest possible interval in which f(x) is a decreasing function is $(-3, -1)$, then the value of p is-

A. 3

B. 9

C. -2

D. none of these

Answer: B

Watch Video Solution

19. In $-4 < x < 4,$ the function $f(x) = \int_{-10}^{x} (t^4 - 4)e^{-4t} dt$ has-

A. no extrema

B. one extremum

C. two extrema

D. four extrema

Answer: C

Watch Video Solution

20. If $a_1, a_2, a_3, a_4, \ldots, a_n$ are n positive real numbers whose product is a fixed number c, then the minimum value of $a_1 + a_2 + \ldots + a_{n-1} + 2a_n$ is-

A. $n(2c)^{\frac{1}{n}}$

B. $(n+1)c^{\frac{1}{n}}$

C. $2nc^{\frac{1}{n}}$

D. $(n+1)(2c)^{\frac{1}{n}}$

Answer: A

Watch Video Solution

21. The length of the longest interval in which the function $3\sin x - 4\sin^3 x$ is increasing, is-

A. $\frac{\pi}{2}$

B. π

C. $\frac{3\pi}{2}$

D. $\frac{\pi}{3}$

Answer: D

Watch Video Solution

22. The real number x when added to its inverse gives the minimum value of the sum at x equal to-

A. -2

B. 2

C. 1

D. -1

Answer: C

Watch Video Solution

23. If minimum value of $f(x) = x^2 + 2bx + 2c^2$ is greater than maximum value of $g(x) = -x^2 - 2cx + b^2$, then for real value of x-

A. $\sqrt{2}|c| > |b|$

B. $|c| > \sqrt{2}|b|$

C. $0 < c < 2b$

D. none of these

Answer: B

Watch Video Solution

24. Let $f(x) = x^3 + bx^2 + cx + d, 0 < b^2 < c.$

Then f(x)-

A. has a local maximum

B. has a local minimum

C. is strictly decreasing

D. is strictly increasing

Answer: D

Watch Video Solution

25. If $v = \frac{4}{3}\pi r^3$, then the rate (in cubic unit) at which v is increasing when $r = 10$ and $\frac{dr}{dt} = 0.01,$ is-

A. 4π

B. π

C. 40π

D. $\frac{4\pi}{3}$

Answer: A

Watch Video Solution

26. If the time rate of change of the radius of a sphere is $\frac{1}{2\pi}$, then the rate of change of its surface area(in square cm), when the radius is 5 cm , is-

A. 20

B. 10

C. 4

D. 5

Answer: A

Watch Video Solution

27. The length of a side of a cube is 10 cm, if an error of 0.05 cm is made in measuring the side, then the percentage error made in calculating its volume is-

A. 2.5

B. 1.6

C. 2.6

D. 1.5

Answer: D

Watch Video Solution

28. Let $y = 2x^2 - 3x + 2$, if x changes to 3.02 from 3 , then the approximate change in y is-

A. 0.16

B. 0.18

C. 0.09

D. 0.12

Answer: B

Watch Video Solution

29. Objective function of a linear programming problem is a-

A. function to be optimized

B. constraint

C. linear function of the variables to be optimized

D. relation among the variables

Answer: C

View Text Solution

30. If the rate of change of y with respect to x is 4 and y is changing at the rate of 12 units/s, then the rate of change of x per second is-

A. 6

B. 4

C. 3

D. 2

Answer: C

Watch Video Solution

Question Paper 3

1. Two perpendicular tangents to $y^2 = 4ax$ always intersect on the line-

A. $x = a$

B. $x + a = 0$

C. $x + 2a = 0$

D. $x = 2a$

Answer: B

Watch Video Solution

2. If the gradient of the tangent at any point (x, y) of a curve which passes through the point $\left(1, \frac{\pi}{4}\right)$ is $\left\{\frac{y}{x} - \sin^2\left(\frac{y}{x}\right)\right\}$, then the equation of the curve is-

A. $y = \cot^{-1}(\log x)$

B. $y = \cot^{-1}\left\{\log\left(\frac{x}{e}\right)\right\}$

C. $y = x\cot^{-1}\{\log(xe)\}$

D. $y = \cot^{-1}\left\{\log\left(\frac{e}{x}\right)\right\}$

Answer: C

Watch Video Solution

Watch Video Solution

3. The number of tangents that can be drawn from the point $(6, 2)$ on the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ is-

A. 0

B. 1

C. 2

D. 4

Answer: A

View Text Solution

View Text Solution

4. The equation of the tangent to the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ at the point $\left(a\cos^3\alpha, a\sin^3\alpha\right)$ is-

A. $x\cos\alpha + y\sin\alpha = a\sin\alpha\cos\alpha$

B. $x\cos\alpha - y\sin\alpha = a\sin 2\alpha$

C. $x\sin\alpha - y\cos\alpha = a\sin 2\alpha$

D. $x\sin\alpha + y\cos\alpha = a\sin\alpha\cos\alpha$

Answer: D

Watch Video Solution

Watch Video Solution

5. If the area enclosed by the parabola $x^2 = 72y$ and the line $y = k$ be $64\sqrt{2}$ square unit, then the value of k is-

A. 2

B. 3

C. 4

D. 6

Answer: C

Watch Video Solution

6. Two intersecting circles have their radii 1 metre and $\sqrt{3}$ metre. The distance between their centres is 2 metre Then the overlapping area (in square metre) is-

A. $\frac{19\pi + 6\sqrt{3}}{6}$

B. $\frac{5\pi + 6\sqrt{3}}{6}$

C. $\frac{\pi}{6}$

D. $\frac{5\pi - 6\sqrt{3}}{6}$

Answer: D

View Text Solution

7. The equation of the tangent to the curve $y = be^{-\frac{x}{a}}$ at the point where it crosses the y-axis is-

A. $bx + ay = ab$

B. $ax + by = 1$

C. $bx - ay = ab$

D. $ax - by = 1$

Answer: A

Watch Video Solution

8. The equations of the two common tangents to the circle $x^2 + y^2 = 2a^2$ and the parabola $y^2 = 8ax$ are-

A. $x = \pm(y + 2a)$

B. $y = \pm(x + 2a)$

C. $x = \pm(y + a)$

D. $y = \pm(x + a)$

Answer: B

Watch Video Solution

9. If the curve $y = a\sqrt{x} + bx$ passes through the point $(1, 2)$ and the area bounded by the curve, the line $x = 4$ and x-axis is 8 square unit, then the values of a and b are-

A. $a = 3, b = 1$

B. $a = -3, b = 1$

C. $a = 3, b = -1$

D. $a = -3, b = -1$

Answer: C

Watch Video Solution

10. The area (in square unit) bounded by the curve $y = \sin x$ between the ordinates $x = 0, x = \pi$ and the x -axis is-

A. 2

B. 4

C. 3

D. 6

Answer: A

Watch Video Solution

11. The equation of the normal to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at the point $(a\cos\theta, b\sin\theta)$ on it is-

A. $ax\sin\theta - by\cos\theta = a^2 - b^2$

B. $ax\sin\theta + by\cos\theta = a^2 - b^2$

C. $ax\cos\theta - by\sin\theta = (a^2 - b^2)\sin\theta\cos\theta$

D. $ax\sin\theta - by\cos\theta = (a^2 - b^2)\sin\theta\cos\theta$

Answer: D

Watch Video Solution

12. The point on the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$, the normal at which is parallel to the x-axis is-

A. $(0, 0)$

B. $(a, 0)$

C. $(0, a)$

D. $\left(\frac{a}{4}, \frac{a}{4}\right)$

Answer: C

Watch Video Solution

13. The slope of the tangent to the curve $x = 3t^2 + 1, y = t^3 - 1$ at $x = 1$ is-

A. $\frac{1}{2}$

B. 0

C. -2

D. undefined

Answer: B

Watch Video Solution

14. If the area above the x-axis bounded by the curve $y = 2^{kx}$ and the lines $x = 0, x = 2$ is $\frac{3}{\log 2}$ square unit, then the value of k is-

A. 1

B. $\frac{1}{2}$

C. -1

D. 2

Answer: A

Watch Video Solution

15. If the line $x + y = 1$ is a tangent to the parabola $y^2 - y + x = 0$, then the point of contact is-

A. $(0, 1)$

B. $(a, 0)$

C. $(1, 1)$

D. $(-1, 0)$

Answer: A

Watch Video Solution

16. The angle between the curves $y = \sin x$ and $y = \cos x$ is-

A. $\tan^{-1}(5\sqrt{2})$

B. $\tan^{-1}(3\sqrt{3})$

C. $\tan^{-1}(3\sqrt{2})$

D. $\tan^{-1}(2\sqrt{2})$

Answer: D

Watch Video Solution

17. The function $f(x) = \cos x - 2ax$ is monotonically decreasing when-

A. $a < \frac{1}{2}$

B. $a > \frac{1}{2}$

C. $a < 0$

D. $a > 0$

Answer: B

Watch Video Solution

18. If PQ and PR are the two sides of a triangle, then the angle between them which gives maximum area of the triangle is-

A. $\frac{\pi}{4}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{2}$

D. $\frac{2\pi}{3}$

Answer: C

Watch Video Solution

19. The function $f(x) = x^3 + 3x^2 + 4x + 7$ is increasing for-

A. all real values of x

B. $x < 0$

C. $x > 0$

D. $x = 0$

Answer: A

Watch Video Solution

20. If $x + y = 60, x, y > 0$, then the maximum value of xy^3 is-

A. 30

B. 60

C. $45 \times (15)^3$

D. $15 \times (45)^3$

Answer: D

Watch Video Solution

21. The points of extrema of $f(x)=\int_0^x \frac{\sin t}{t}dt$ in the domain $x>0$, are-

A. $(2n+1)\frac{\pi}{2}$

B. $n\pi$

C. $(4n+1)\frac{\pi}{2}$

D. $(2n+1)\frac{\pi}{4}$

Answer: B

Watch Video Solution

22. If the function $f(x) = 2x^3 - 9ax^2 + 12a^2x + 1$, where $a > 0$ attains its maximum and minimum at $x = p$ and $x = q$ respectively, such that $p^2 = q$, then the value of a is-

A. $\frac{1}{2}$

B. 3

C. 1

D. 2

Answer: D

Watch Video Solution

23. A land in the form of a circular sector has been fenced by wire of 40 metre length. The area of the land will be maximum when the radius of the circular sector (in metre) is-

A. 25

B. 20

C. 10

D. 15

Answer: C

View Text Solution

24. The maximum value of the function $f(x) = 3\cos x - 4\sin x$ is-

A. 5

B. 4

C. 3

D. 2

Answer: A

Watch Video Solution

25. The function $f(x)=\dfrac{\lambda\sin x+6\cos x}{2\sin x+3\cos x}$ is monotonic increasing when-

A. $\lambda > 1$

B. $\lambda > 4$

C. $\lambda < 1$

D. $\lambda < 4$

Answer: B

Watch Video Solution

26. The surface area of a spherical bubble is increasing at the rate of $2cm^2 / s$. Then the rate at which the volume of the bubble is increasing at the instant when its radius is 6 cm, is-

A. $3cm^3 / s$

B. $2cm^3 / s$

C. $4cm^3 / s$

D. $6cm^3 / s$

Answer: D

Watch Video Solution

27. A point on the parabola $y^2 = 18x$ at which the ordinate increases at twice the rate of the abscissa is-

A. $\left(-\frac{9}{8}, \frac{9}{2}\right)$

B. $(2, -6)$

C. $(2, 6)$

D. $\left(\frac{9}{8}, \frac{9}{2}\right)$

Answer: D

Watch Video Solution

28. A function $y = f(x)$ has a second order derivative $f''(x) = 6(x-1)$. If its graph passes through the point (2, 1) and at that point the tangent to the graph is $y = 3x - 5$, then the function is-

A. $(x+1)^3$

B. $(x-1)^3$

C. $(x-1)^2$

D. $(x-1)^3+2$

Answer: B

Watch Video Solution

29. Maximize : $Z = 5y + 2x$ subject to constraints-

$x + 2y \leq 4,\ 7x + 8y \geq 56,\ x \geq 0,\ y \geq 0.$ The solution of the above LPP is-

A. 30

B. 48

C. 36

D. none of these

Answer: D

View Text Solution

30. An open box with a square base is made out of a given iron sheet of area 27 sq.m. Then, the maximum volume of the box is-

A. $9m^3$

B. $27m^3$

C. $13.5m^3$

D. $18m^3$

Answer: C

Watch Video Solution

Question Paper 4

1. The point on the curve $y^2 = x$, the tangent at which makes an angle 45° with the x- axis is-

A. $(0, 0)$

B. $\left(\frac{1}{4}, \frac{1}{2}\right)$

C. $\left(\frac{1}{2}, \frac{1}{4}\right)$

D. $(2, 4)$

Answer: B

Watch Video Solution

2. If p_1 and p_2 be the lengths of the perpendiculars from the origin upon the tangent and normal respectively to the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ at the point (x_1, y_1), then-

A. $p_1^2 + 4p_2^2 = a^2$

B. $p_1^2 + 4p_2^2 = 2a^2$

C. $4p_1^2 + p_2^2 = 2a^2$

D. $4p_1^2 + p_2^2 = a^2$

Answer: D

Watch Video Solution

3. Find the area of the region included between the parabola $y^2 = x$ and the line $x + y = 2$.

Watch Video Solution

4. If the straight line joining the point (0, 3) and (5, -2) is a tangent to the curve $y(x + 1) = c$, then the value of c will be-

A. 3

B. -3

C. 4

D. -4

Answer: C

Watch Video Solution

5. The equation of the normal to the hyperbola $x = a\sec\theta, y = b\tan\theta$ at the point $(a\sec\theta, b\tan\theta)$ is-

A. $ax\cos\theta + by\cot\theta = a^2 + b^2$

B. $ax\cos\theta + by\tan\theta = a^2 + b^2$

C. $ax\sin\theta - by\cot\theta = a^2 - b^2$

D. $ax\cos\theta - by\tan\theta = a^2 - b^2$

Answer: A

Watch Video Solution

6. If the straight line $lx + my = 1$ is a normal to the parabola $y^2 = 4ax$, then-

A. $al^2 + 2lm = m^2$

B. $al^3 - 2alm = m^2$

C. $al^3 + 2alm^2 = m^2$

D. $al^2 + 2aml = m^2$

Answer: C

Watch Video Solution

7. The area (in square unit) of the region $\{(x, y) : x^2 + y^2 \leq 1 \leq x + y\}$ is-

A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$

C. $\frac{\pi^2}{4}$

D. $\frac{\pi}{4}-\frac{1}{2}$

Answer: D

View Text Solution

8. The area (in square unit) bounded by the curve $y=\sec x$, the x-axis and the lines $x=0$ and $x=\frac{\pi}{4}$ is-

A. $\log(\sqrt{2}-1)$

B. $\log(\sqrt{2}+1)$

C. $\frac{1}{2}\log 2$

D. $\sqrt{2}$

Answer: B

Watch Video Solution

9. The angle between the parabolas $y^2 = x$ and $x^2 = y$ at the origin is-

A. $2\tan^{-1}\frac{3}{4}$

B. $\tan^{-1}\frac{4}{3}$

C. $\frac{\pi}{2}$

D. $\frac{\pi}{4}$

Answer: C

Watch Video Solution

10. The area (in square unit) of the smaller segment cut off from the circle $x^2 + y^2 = 9$ by the line $x = 1$ is-

A. $\frac{1}{2}\left(9\sec^{-1}3-\sqrt{8}\right)$

B. $9\sec^{-1}3-\sqrt{8}$

C. $\sqrt{8}-9\sec^{-1}3$

D. $9\sec^{-1}3+\sqrt{8}$

Answer: B

Watch Video Solution

11. The optimal value of the objective function in a LPP is attained at points-

A. given by intersection of inequations with coordinate axes,

B. given by intersection of constraints with y-axis,

C. given by intersection of constraints with x-axis,

D. given by corner points of solution region.

Answer: D

View Text Solution

12. If the tangent at any point P to the parabola $y^2 = 4ax$ meets the directrix at the point K , then the angle which KP subtends at its focus is-

A. 90°

B. 60°

C. 45°

D. 30°

Answer: A

Watch Video Solution

13. The point (or points) on the curve $y^3 + 3x^2 = 12y$ where tangent is vertical is/are-

A. $\left(\pm \frac{4}{\sqrt{3}}, 2 \right)$

B. $(0, 0)$

C. $\left(\pm \sqrt{\frac{11}{3}}, 1 \right)$

D. $\left(\pm \frac{4}{\sqrt{3}}, -2 \right)$

Answer: A

Watch Video Solution

14. Tangents are drawn to the ellipse $5x^2 + 9y^2 = 45$ at the four ends of two latera recta. The area (in square unit) of the quadrilateral so formed is-

A. $\frac{81}{4}$

B. $\frac{27}{4}$

C. 27

D. $\frac{27}{2}$

Answer: C

Watch Video Solution

15. The normal to the parabola $y^2 = 8x$ at the point (2, 4) meets the parabola again at the point-

A. $(-18, -12)$

B. $(-18, 12)$

C. $(18, 12)$

D. $(18, -12)$

Answer: D

Watch Video Solution

16. A tangent is drawn at the point $\left(3\sqrt{3}\cos\theta, \sin\theta\right)\left(0 < \theta < \frac{\pi}{2}\right)$ to the ellipse $x^2 + 27y^2 = 27$, then the least value of the sum of the intercepts on the coordinate axes by this tangent is attained when the value of θ is-

A. $\frac{\pi}{3}$

B. $\frac{\pi}{6}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{8}$

Answer: B

Watch Video Solution

17. A cone of height h is inscribed in a sphere of radius R , if the volume of the inscribed cone is maximum, then the value of h : R will be-

A. $\frac{\sqrt{3}}{1}$

B. $\frac{4}{3}$

C. $\frac{2}{3}$

D. $\frac{3}{2}$

Answer: B

Watch Video Solution

18. If $f(x) = \int_{x^2}^{x^2+1} e^{-t^2} dt$, then the interval in which f(x) is increasing, is-

A. $(-\infty, 0)$

B. $(0, \infty)$

C. $[-2, 2]$

D. $[3, 5]$

Answer: A

Watch Video Solution

19. The minimum value of $f(x) = 2x^2 + x - 1$ is-

A. $-\frac{1}{4}$

B. $\frac{3}{4}$

C. $\frac{9}{4}$

D. $-\frac{9}{8}$

Answer: D

Watch Video Solution

20. The point on the curve $xy^2 = 1$ that is nearest to the origin is-

A. $(1, 1)$

B. $\left(4, \frac{1}{2}\right)$

C. $\left(2^{-\frac{1}{3}}, 2^{\frac{1}{6}}\right)$

D. $\left(\frac{1}{4}, 2\right)$

Answer: C

Watch Video Solution

21. The number of values of x for which $f(x) = \cos x + \cos \sqrt{2}x$ attains its maximum value is-

A. 1

B. 0

C. 2

D. infinite

Answer: A

Watch Video Solution

22. The function $f(x) = 2x^3 - 15x^2 + 36x + 1$

is increasing in the interval-

A. $x \leq 1$ or $x \geq 3$

B. $x < 2$ or $x > 3$

C. $x \geq 2$ or $x \leq 3$

D. none of these

Answer: b

Watch Video Solution

23. The coordinates of the point for minimum value of $Z = 7x - 8y$, subject to the conditions $x + y \leq 20$, $y \geq 5$ and $x \geq 0$ are-

A. $(20, 0)$

B. $(0, 20)$

C. $(15, 5)$

D. $(0, 5)$

Answer: B

Watch Video Solution

24. If M and m are the maximum and minimum values respectively of the function $f(x) = x + \frac{1}{x}$, then the value of M - m is-

A. 0

B. 2

C. 4

D. -4

Answer: D

Watch Video Solution

25. The interval in which the function $f(x) = 2x^2 - \log|x| (x \neq 0)$ is increasing, is-

A. $0 < x < \frac{1}{2}$

B. $x < -\frac{1}{2}$

C. $-\frac{1}{2} < x < 0 \text{ or, } x > \frac{1}{2}$

D. none of these

Answer: C

Watch Video Solution

26. The sides of an equilateral triangle are increasing at the rate of $2cm / s.$, then the rate at which the area (in cm^2 / s) increases when the side is 10 cm , is-

A. $\sqrt{3}$

B. $10\sqrt{3}$

C. 10

D. $10\sqrt{2}$

Answer: B

Watch Video Solution

27. Air is being pumped into a spherical balloon at the rate of 30 cm^3 / s. Then the rate (in cm / s) at which the radius increases when it reaches the value 15 cm , is-

A. $\frac{1}{30\pi}$

B. $\frac{1}{15\pi}$

C. $\frac{1}{20}$

D. $\frac{1}{25}$

Answer: A

Watch Video Solution

28. If the curves xy = a and $x = y^2$ intersect at right angles, then-

A. $16a^2 = 1$

B. $8a^2 + 1 = 0$

C. $8a^2 = 1$

D. $16a^2 + 1 = 0$

Answer: C

Watch Video Solution

29. A curve having the condition that the slope of tangent at some point is two times the slope of the straight line joining the same point to the origin of coordinates is a / an-

A. circle

B. parabola

C. ellipse

D. hyperbola

Answer: B

Watch Video Solution

30. An edge of a variable cube is increasing at the rate of 2 cm/s. When the edge of a cube is 8 cm long, then its volume will increase at the rate of-

A. $128cm^3/s$

B. $192cm^3/s$

C. $384cm^3/s$

D. none of these

Answer: C

Watch Video Solution

Question Paper 5

1. The equation of a tangent to the hyperbola $x^2 - 2y^2 = 2$ parallel to the line $2x - 2y + 5 = 0$ is-

A. $y = 2x + 1$

B. $y = 2x - 1$

C. $y = x \pm 1$

D. $x + y + 1 = 0$

Answer: C

Watch Video Solution

2. The area (in square unit) surrounded by the curve $|x| + |y| = 1$ is-

A. 5

B. 4

C. 3

D. 2

Answer: D

Watch Video Solution

3. The slope of the normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at the point $(a\sec\theta, b\tan\theta)$ is-

A. $\frac{b}{a}\sin\theta$

B. $-\frac{a}{b}\sin\theta$

C. $\frac{a}{b}\sin\theta$

D. $-\frac{b}{a}\sin\theta$

Answer: B

Watch Video Solution

4. If the straight line $y = x\sin\alpha + a\sec\alpha$ is a tangent to the circle $x^2 + y^2 = a^2$ then-

A. $\cos 2\alpha = 1$

B. $\sin^2\alpha = 1$

C. $\sin 2\alpha = 1$

D. $\tan^2 \alpha = 2$

Answer: A

Watch Video Solution

5. The angle between the pair of tangents drawn to the ellipse $3x^2 + 2y^2 = 5$ from the point (1, 2) is-

A. $\tan^{-1}\left(\frac{12}{5}\right)$

B. $\tan^{-1}\left(\frac{12}{\sqrt{5}}\right)$

C. $\tan^{-1}\left(\frac{6}{\sqrt{5}}\right)$

D. $\tan^{-1}\left(\frac{6}{5}\right)$

Answer: B

Watch Video Solution

6. The angle of intersection of the cuves $y = x^2$ and $6y = 7 - x^3$ at (1, 1) is-

A. $\frac{\pi}{4}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{6}$

D. $\frac{\pi}{2}$

Answer: D

Watch Video Solution

7. If the tangent at the point p on the circle $x^2 + y^2 + 6x + 6y - 2 = 0$ meets the straight line $5x - 2y + 6 = 0$ at the point Q on the y-axis, then the length of PQ is-

A. 4 units

B. $2\sqrt{5}$ units

C. 5 units

D. $3\sqrt{5}$ units

Answer: C

Watch Video Solution

8. The equation of the common tangent to the curves $y^2 = 8x$ and $xy = -1$ is-

A. $3y = 9x + 2$

B. $y = x + 2$

C. $y = 2x + 1$

D. $2y = x + 8$

Answer: B

Watch Video Solution

9. Area (in square unit) bounded by the curve $y = \sqrt{x}$, the straight line $x = 2y + 3$ in first quadrant and x- axis is-

A. 9

B. $2\sqrt{3}$

C. 18

D. $\frac{35}{3}$

Answer: A

Watch Video Solution

10. The area bounded by the coordinate axes and the curve $\sqrt{x} + \sqrt{y} = 1$ is equal to-

A. $\frac{1}{6}$

B. $\frac{1}{3}$

C. $\frac{1}{2}$

D. 1

Answer: A

Watch Video Solution

11. The normal to the curve $x = a(1 + \cos\theta), y = a\sin\theta$ at the point θ always passes throught the fixed point-

A. $(0, 0)$

B. $(0, a)$

C. (a, a)

D. $(a, 0)$

Answer: D

Watch Video Solution

12. If the area bounded by the parabola $y = ax^2$ and $x = ay^2, a > 0$ is 1 square unit , then the value of a is-

A. 1

B. $\frac{1}{\sqrt{3}}$

C. $\frac{1}{3}$

D. $\frac{1}{\sqrt{2}}$

Answer: B

Watch Video Solution

13. The locus of the middle point of the intercept of the tangent drawn from an external point to the ellipse $x^2 + 2y^2 = 2$ between the coordinate axes is-

A. $\dfrac{1}{x^2} + \dfrac{1}{2y^2} = 1$

B. $\dfrac{1}{4x^2} + \dfrac{1}{2y^2} = 1$

C. $\dfrac{1}{2x^2} + \dfrac{1}{4y^2} = 1$

D. $\dfrac{1}{2x^2} + \dfrac{1}{y^2} = 1$

Answer: C

Watch Video Solution

14. Which one of the following definite integrals represents the area included between the parabola $4y = 3x^2$ and the straight line $2y = 3x + 12$?

A. $\int_{-2}^{4} \frac{3x^2}{4} dx$

B. $\int_{0}^{4} \left(\frac{3x + 12}{2} - \frac{3x^2}{4} \right) dx$

C. $\int_{-2}^{4} \left(\frac{3x + 12}{2} - \frac{3x^2}{4} \right) dx$

D. $\int_{-2}^{2} \left(\frac{3x + 12}{2} - \frac{3x^2}{4} \right) dx$

Answer: C

Watch Video Solution

15. A normal to the parabola $y^2 = 5x$ makes an angle 45° with the x-axis. Find the equation of the normal and the cooridnates of its foot.

A. $\left(\frac{5}{4}, -\frac{5}{2}\right)$

B. $\left(\frac{5}{2}, -\frac{5}{4}\right)$

C. $\left(\frac{5}{4}, \frac{5}{2}\right)$

D. $\left(\frac{5}{2}, \frac{5}{4}\right)$

Answer: A

Watch Video Solution

16. If the tangents to the graph of the function $y = f(x)$ make angle $\frac{\pi}{4}$ and $\frac{\pi}{3}$ with the x- axis at the point $x = 2$ and $x = 4$ respectively, then the value of $\int_2^4 f'(x)f''(x)dx$ is-

A. $f(4)$

B. $f(2)$

C. 0

D. 1

Answer: D

Watch Video Solution

17. The maximum value of xy when $x + 2y = 8$ is

A. 20

B. 16

C. 8

D. 24

Answer: C

Watch Video Solution

18. The function $f(x) = \tan^{-1}(\sin x + \cos x), x > 0$ is always an increasing function on the interval-

A. $(0, \pi)$

B. $\left(0, \frac{\pi}{2}\right)$

C. $\left(0, \frac{\pi}{4}\right)$

D. $\left(0, \frac{3\pi}{4}\right)$

Answer: C

Watch Video Solution

19. The points of extrema of the function $f(x) = \int_0^x \frac{\sin t}{t} dt$ in the domain $x > 0$ are-

A. $(2n+1)\frac{\pi}{2}, n = 1, 2, 3, \ldots$

B. $(4n+1)\frac{\pi}{2}, n = 1, 2, 3, \ldots$

C. $(2n+1)\frac{\pi}{4}, n = 1, 2, 3, \ldots$

D. $n\pi, n = 1, 2, 3, \ldots$

Answer: D

Watch Video Solution

20. The minimum value of the function $f(x) = \sin x + \cos x$ is-

A. $-\sqrt{2}$

B. $-2\sqrt{2}$

C. -1

D. $\sqrt{2}$

Answer: A

Watch Video Solution

21. The perimeter of a sector is p , then the area of the sector is maximum when its radius is-

A. p

B. $\frac{p}{4}$

C. $\frac{p}{3}$

D. $\frac{p}{2}$

Answer: B

Watch Video Solution

22. The value of $a(a \geq 3)$ for which the sum of the cubes of the roots of $x^2 - (a-2)x + (a-3) = 0$, assumes the least value is-

A. 3

B. 4

C. 5

D. none of these

Answer: D

Watch Video Solution

23. If $f(x) = x^3 + \frac{1}{x^3}(x \neq 0)$, then its greatest value is-

A. 2

B. 1

C. 3

D. none of these

Answer: D

Watch Video Solution

24. The nearest point on the line $3x - 4y = 25$ from the origin is

A. (3, -4)

B. (-1, -7)

C. (-5, 8)

D. (3, 4)

Answer: A

Watch Video Solution

25. If the slope of the tangent at (x, y) to a curve passing through the point $(2, 1)$ is $\dfrac{x^2 + y^2}{2xy}$, then the equation of the curve is-

A. $x^2 - y^2 = 3y$

B. $x(x^2 - y^2) = 6$

C. $2(x^2 - y^2) = 3x$

D. $x(x^2 + y^2) = 6$

Answer: C

Watch Video Solution

26. An open box, with a square base, is to be made out of a given quantity of metal sheet of area A^2 , then the maximum volume of the box is-

A. $\frac{A^3}{3\sqrt{3}}$

B. $\frac{2A^3}{3\sqrt{3}}$

C. $\frac{A^3}{6\sqrt{3}}$

D. $\frac{A^3}{2\sqrt{3}}$

Answer: C

Watch Video Solution

27. If the radius of a sphere is measured as 5 m with an error of 0.02 m, then the approximate error in calculating its volume is-

A. π

B. 2π

C. 4π

D. 5π

Answer: B

Watch Video Solution

28. If the volume of a sphere increases at a constant rate, then the rate at which its radius increases, is-

A. inversely proportional to the surface area of the sphere ,

B. a constant ,

C. proportional to the radius ,

D. inversely proportional to the radius.

Answer: A

Watch Video Solution

29. Let A(0, 75), B(90, 0) , C(60, 40) and D(45, 25) be the corner points of the bounded feasible region of a LPP . If the objective function is $Z = 3x + 4y$, then Z is maximum at corner point-

A. B

B. D

C. A

D. C

Answer: D

Watch Video Solution

30. If $f(x) = 2x^2 + 10x - 7$, then the approximate value of $f(2.05)$ is-

A. 24.08

B. 28.9

C. 21.9

D. 21.08

Answer: C

Watch Video Solution

Question Paper 6

1. The equation of the tangent to the parabola $y^2 = 4x + 5$ which is parallel to the line $y = 2x + 7$ is-

A. $y = 2x - 3$

B. $y = 2x + 3$

C. $y = 2x - 5$

D. $y = 2x + 5$

Answer: B

Watch Video Solution

2. The slope of the normal to the curve $y = \dfrac{2x}{1 + x^2}$ at y=1 is-

A. 1

B. 0

C. 2

D. ∞

Answer: D

Watch Video Solution

3. A function $y = f(x)$ is defined as follows :

$$y = f(x) = \begin{cases} x^2 & \text{when } 0 \le x \le 1 \\ \sqrt{x} & \text{when } x \ge 1 \end{cases}$$

Then the area (in square unit) above the x- axis included between the curve y= f(x) and the line x = 4 is-

A. $\frac{15}{3}$

B. 4

C. 5

D. 6

Answer: C

Watch Video Solution

4. The coordinates of the point on the parabola $x = 3y^2 + 4y + 2$ at which the slope of the normal is 8, are-

A. (6, -2)

B. (2, 0)

C. (1, -1)

D. (9, 1)

Answer: A

Watch Video Solution

5. The area (in square unit) of the region bounded by the curve $9x^2 + 4y^2 = 36$ is-

A. 36π

B. 9π

C. 6π

D. 4π

Answer: C

Watch Video Solution

6. If θ is the acute angle of intersection at a real point of intersection of the circle $x^2 + y^2 = 5$

and the parabola $y^2 = 4x$, then the value of $\tan\theta$ is-

A. 1

B. $\sqrt{3}$

C. $\frac{1}{\sqrt{3}}$

D. 3

Answer: D

Watch Video Solution

7. The area (in square unit) of the triangle bounded by the lines $y = 2, x + y = 0$ and $x - y = 0$ is-

A. 4

B. 8

C. 12

D. 16

Answer: B

Watch Video Solution

8. If the tangent to the curve $y^2 = x^3$ at the point (m^2, m^3) is also the normal to the curve at (M^2, M^3) , then the value of mM is-

A. $-\frac{4}{9}$

B. $-\frac{1}{3}$

C. $-\frac{2}{9}$

D. $-\frac{1}{9}$

Answer: A

Watch Video Solution

9. If A is the area of the region bounded by the curve $y = \sqrt{3x + 4}$, x- axis and the lines $x = -1$ and x=4 and B is the area bounded by the curve $y^2 = 3x + 4$ and the lines x=-1 and x=4 , then the value of A : B is-

A. $1 : 1$

B. $2 : 1$

C. $2 : 3$

D. $3 : 2$

Answer: A

Watch Video Solution

10. The locus of a point $P(\alpha, \beta)$ moving under the condition that the line $y = \alpha x + \beta$ is a tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is a/an-

A. parabola

B. hyperbola

C. circle

D. ellipse

Answer: B

Watch Video Solution

11. The curves $y = \sin x$ and $y = \cos x$ intersect infinitely many times giving bounded regions of equal areas. The area (in square unit) of one such region is-

A. $4\sqrt{2}$

B. $3\sqrt{2}$

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer: D

Watch Video Solution

12. From a point (d, 0) three normals are drawn to the parabola $y^2 = x$, then

A. 30°

B. 45°

C. 90°

D. 60°

Answer: C

Watch Video Solution

13. The condition that the line $ax + by + c = 0$ is a tangent to the parabola $y^2 = 4ax$ is-

A. $a = b$

B. $b^2 = c$

C. $b^2 = a$

D. $a^2 = b$

Answer: B

Watch Video Solution

14. 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 passes through the origin

B. it passes through (a, -a)

C. it is at a constant distance from the origin

D. it makes angle $\left(\frac{\pi}{4} + \theta\right)$ with the x- axis

Answer: C

Watch Video Solution

15. If the tangent to the parabola $y = x^2 + 6$ at the point (1, 7) also touches the circle $x^2 + y^2 + 16x + 12y + c = 0$, then the coordinates of the point of contact are-

A. (-1, -2)

B. (2, 3)

C. (6, -7)

D. (-6, -7)

Answer: D

Watch Video Solution

16. The parabolas $y^2 = 4x$ and $x^2 = 4y$ divide the square region bounded by the line x = 4 , y = 4 and the coordinate axes into three parts. If S_1, S_2, S_3 are respectively the areas of these three parts numbered from top to bottom then $S_1 : S_2 : S_3$ is-

A. $1:1:1$

B. $2:1:2$

C. $1:2:1$

D. $1:2:3$

Answer: A

Watch Video Solution

17. The greatest value of the function $f(x) = x^2 \log \frac{1}{x}$ is-

A. $\frac{1}{e}$

B. $\frac{1}{2e}$

C. e

D. 2e

Answer: B

Watch Video Solution

18. If $f(x) = x^3 - 6x^2 + 9x + 3$ be a decreasing function, then x lies in-

A. $(1, 3)$

B. $(-\infty, -1) \cup (3, \infty)$

C. $(3, \infty)$

D. none of these

Answer: A

Watch Video Solution

19. The minimum value of the function $f(\theta) = 6\cos\theta + 8\sin\theta + 11$ is-

A. 2

B. $\frac{1}{2}$

C. 1

D. 0

Answer: C

Watch Video Solution

20. The abscissa of the point on the parabola $y^2 = 2px$ which is nearest to the point (a, 0) is-

A. $a+p$

B. $-(a+p)$

C. $p-a$

D. $a-p$

Answer: D

Watch Video Solution

21. The value of a for which the function $(a+2)x^3-3ax^2+9ax-1$ decreases monotonically throughout for all real values of x

, are-

A. $a < -2$

B. $a > -2$

C. $-3 < a < 0$

D. $a \leq -3$

Answer: D

Watch Video Solution

22. A minimum value of the function $f(x) = \int_0^x te^{-t^2}\,dt$ is-

A. 0

B. 1

C. 2

D. -2

Answer: A

Watch Video Solution

23. If $f(x) = x^3 + ax^2 + bx + c$ is an increasing function for all real values of x then-

A. $a^2 > 3b$

B. $a^2 < 3b$

C. $b^2 > 3a$

D. $b^2 < 3a$

Answer: B

Watch Video Solution

24. The area (in square unit) in the first quadrant bounded by the parabolas $y^2 = 4x, y^2 = 16x$ and the straight line $x = 9$ is-

A. 9

B. 18

C. 36

D. 72

Answer: C

Watch Video Solution

25. The slope of the tangent at (x, y) to a curve passing through $\left(1, \frac{\pi}{4}\right)$ is given by $\frac{y}{x} - \cos^2\left(\frac{y}{x}\right)$, then the equation of the curve is-

A. $y = \tan^{-1}\left[\log\left(\frac{e}{x}\right)\right]$

B. $y = x\tan^{-1}\left[\log\left(\frac{x}{e}\right)\right]$

C. $y = x\tan^{-1}\left[\log\left(\frac{e}{x}\right)\right]$

D. $y = \tan^{-1}\left[\log\left(\frac{x}{e}\right)\right]$

Answer: C

Watch Video Solution

26. The time rate of change of the radius of a sphere is $\frac{1}{2\pi}$. When its radius is 5 cm , then the rate of change of the area of the surface (in square cm) of the sphere with time will be-

A. 25

B. 15

C. 24

D. 20

Answer: D

Watch Video Solution

27. The rate at which microbe multiply is proportional to the instantaneous number present . If the original number doubles in 2 hours, then they will triple in-

A. $4\cdot\dfrac{\log 2}{\log 3}$ hours

B. $2\cdot\dfrac{\log 3}{\log 2}$ hours

C. $5\cdot\dfrac{\log 2}{\log 3}$ hours

D. $\frac{\log 3}{\log 2}$ hours

Answer: B

Watch Video Solution

28. A spherical iron ball of radius 10 cm is coated with layer of ice of uniform thickness that melts at a rate of 50 $cm^3 / \min$. When the thickness of ice is 5 cm, then the rate at which the thickness of ice (in cm/ min unit) decreases, is-

A. $\frac{1}{18\pi}$

B. $\frac{1}{36\pi}$

C. $\frac{5}{6\pi}$

D. $\frac{1}{54\pi}$

Answer: A

Watch Video Solution

29. The length of a longest interval in which the function $f(x) = 3\sin x - 4\sin^3 x$ is increasing, is-

A. $\frac{\pi}{2}$

B. $\frac{\pi}{3}$

C. π

D. $\frac{3\pi}{2}$

Answer: B

Watch Video Solution

30. The vertex of the parabola $x^2 - 6x + 4y + 1 = 0$ is

A. $(2, 3)$

B. $(3, 2)$

C. $(3, 1)$

D. none of these

Answer: B

Watch Video Solution

Question Paper 7

1. If the line $ax + by + c = 0$ is a normal to the curve $xy = 1$ at the point (1, 1), then -

A. $a = b$

B. $a = -b$

C. $a^2 = b$

D. $b^2 = a$

Answer: B

Watch Video Solution

2. Two equal parabolas have the same vertex and their axes are at right angles. Then the angle between the tangents to them at their point of intersection (other than vertex) is-

A. $\frac{\pi}{4}$

B. $\tan^{-1} 2$

C. $\tan^{-1} \frac{3}{4}$

D. $\frac{\pi}{3}$

Answer: C

View Text Solution

3. If three normals are drawn from the point $(c, 0)$ to the parabola $y^2 = x$, then-

A. $c < \frac{1}{2}$

B. $c \geq 2$

C. $c < 2$

D. $c \geq \frac{1}{2}$

Answer: D

Watch Video Solution

4. If tangents are drawn from the origin to the curve $y = \sin x$, then their points of contact lie on-

A. $x^2y^2 = x^2 - y^2$

B. $x^2y^2 = y^2 - x^2$

C. $x^2y^2 = x^2 + y^2$

D. $x^2y^2 = 2(x^2 - y^2)$

Answer: A

Watch Video Solution

5. The line, among the following, that touches the parabola $y^2 = 4ax$ is-

A. $x + my + am^3 = 0$

B. $x - my + am^2 = 0$

C. $x + my - am^2 = 0$

D. $y + mx + am^2 = 0$

Answer: B

Watch Video Solution

6. If $y = 3x$ is a tangent to a circle with centre $(1, 1)$, then the other tangent drawn throught $(0, 0)$ to the circle is-

A. $3x + y = 0$

B. $2x + y = 0$

C. $y = 2x$

D. $x = 3y$

Answer: D

Watch Video Solution

7. From any point P(x, y) of the curve $y = x^m (m > 0, x > 0)$ perpendiculars PN and PM are dropped on the coordinate axes. Then the ratio of the area OMPO and the area of the rectangle ONPM (O represents the origin) is-

A. $\dfrac{1}{m+1}$

B. $\dfrac{1}{2(m+1)}$

C. $\dfrac{2}{m+1}$

D. $\dfrac{1}{3(m+1)}$

Answer: A

Watch Video Solution

8. The area enclosed between the curve $y = \log_e(x + e)$ and the coordinate axes (in square unit) is-

A. 3

B. 4

C. 1

D. 2

Answer: C

Watch Video Solution

9. Let $f(x)$ be non- negative continuous function such that the area bounded by the curve $y = f(x)$, x- axis and the ordinates $x = \frac{\pi}{4}$ and $x = \beta\left(\beta > \frac{\pi}{4}\right)$ is $\beta \sin \beta + \frac{\pi}{4}\cos \beta + \sqrt{2}\beta$. Then the value of $f\left(\frac{\pi}{2}\right)$ is-

A. $1 - \frac{\pi}{4} - \sqrt{2}$

B. $1 - \frac{\pi}{4} + \sqrt{2}$

C. $\frac{\pi}{4} + \sqrt{2} - 1$

D. $\frac{\pi}{4} - \sqrt{2} + 1$

Answer: B

Watch Video Solution

10. If the equation of the tangent to the circle $x^2 + y^2 - 2x + 6y - 6 = 0$ parallel to the line $3x - 4y + 7 = 0$ is $3x - 4y + k = 0$, then the value of k is-

A. $5, \ -35$

B. $-5, 35$

C. $7, \ -32$

D. $-7, 32$

Answer: A

Watch Video Solution

11. The locus of the point of intersection of a pair of perpendicular tangents to an ellipse is a/an-

A. parabola

B. ellipse

C. hyperbola

D. circle

Answer: D

Watch Video Solution

12. The straight line $x + y = \sqrt{2}p$ will touch the hyperbola $4x^2 - 9y^2 = 36$ if-

A. $p^2 = 2$

B. $2p^2 = 5$

C. $p^2 = 5$

D. $5p^2 = 2$

Answer: B

Watch Video Solution

13. If the focal chord of $y^2 = 16x$ is a tangent to the circle $(x-6)^2 + y^2 = 2$, then the possible values of the slope of the chord are-

A. $-2, \frac{1}{2}$

B. $-\frac{1}{2}, 2$

C. $1, \ -1$

D. $\frac{1}{2}, 2$

Answer: C

Watch Video Solution

14. The area (in square unit) bounded by the curves $y = |x| - 1$ and $y = \ - |x| + 1$ is-

A. 1

B. 2

C. $2\sqrt{2}$

D. 4

Answer: B

Watch Video Solution

15. If the normal at the point $(bt_1^2, 2bt_1)$ to the parabola $y^2 = 4bx$ meets it again at the point $(bt_2^2, 2bt_2)$, then-

A. $t_2 = t_1 - \frac{2}{t_1}$

B. $t_2 = -t_1 + \frac{2}{t_1}$

C. $t_2 = t_1 + \frac{2}{t_1}$

D. $t_2 = -t_1 - \frac{2}{t_1}$

Answer: D

Watch Video Solution

16. The line $y = mx + c$ touches the hyperbola $b^2x^2 - a^2y^2 = a^2b^2$ if-

A. $c^2 = a^2m^2 - b^2$

B. $c^2 = a^2m^2 + b^2$

C. $c^2 = b^2m^2 - a^2$

D. $a^2 = b^2m^2 + c^2$

Answer: A

Watch Video Solution

17. The least value of the sum of any positive real number and its reciprocal is-

A. 1

B. -1

C. -2

D. 2

Answer: D

Watch Video Solution

18. The function $f(x) = x^{\frac{1}{x}}$ is-

A. increasing in $(1, \infty)$

B. decreasing in $(1, \infty)$

C. increasing in $(-\infty, e)$ and decreasing in (e, ∞)

D. decreasing in $(1, e)$ and increasing in (e, ∞)

Answer: C

Watch Video Solution

19. If the chord of contact of tangents from a point on the circle $x^2 + y^2 = a^2$ to the circle

$x^2 + y^2 = b^2$ touches the circle $x^2 + y^2 = c^2$,

then a, b, c are in-

A. A.P.

B. H.P.

C. G.P.

D. none of these

Answer: C

Watch Video Solution

20. The value of x for which the polynomial $2x^3 - 9x^2 + 12x + 4$ is a decreasing function of x, is-

A. $-1 < x < 1$

B. $1 < x < 2$

C. $0 < x < 2$

D. $1 < x < 3$

Answer: B

Watch Video Solution

21. The length of the rectangle of maximum area that can be inscribed in a semicircle of radius 1 unit, so that two vertices lie on the diameter, is-

A. $\sqrt{2}$ unit

B. 2 unit

C. $\frac{\sqrt{2}}{3}$ unit

D. $\sqrt{3}$ unit

Answer: A

Watch Video Solution

22. If the tangent at any point on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ intersects the coordinate axes at P and Q , then the minimum value of the area (in square unit) of the triangle OPQ is (O being the origin)-

A. ab

B. $\frac{1}{2}\left(a^2+b^2\right)$

C. 2ab

D. a^2+b^2

Answer: A

Watch Video Solution

23. The minimum value of $4e^{2x} + 9e^{-2x}$ is-

A. 12

B. 11

C. 10

D. 14

Answer: A

Watch Video Solution

24. Suppose the function $f(x)$ is defined as follows :

$$f(x) = x(x-1)(x-2)(x-3)...(x-100)$$

Then which one of the following is correct ?

A. The function has 100 local maxima

B. The function has 50 local maxima

C. The function has 51 local maxima

D. Local maxima do not exist for this function

Answer: B

Watch Video Solution

25. The pressure p and the volume v of a gas are connected by the relation $pv^{1.4} = k$, where k is a constant. Then a decrease of $0.5\,\%$ in the volume of the gas corresponds to an increase of pressure by-

A. $0.6\,\%$

B. $0.7\,\%$

C. $0.8\,\%$

D. $0.9\,\%$

Answer: B

Watch Video Solution

26. The population of a country doubles in 50 years. Assuming that the rate of increase of population is proportional to the number of inhabitants, in how many years would the population becomes three times ?

A. $50 \cdot \dfrac{\log 3}{\log 2}$

B. $50 \cdot \dfrac{\log 2}{\log 3}$

C. $50 \log 6$

D. 75

Answer: A

Watch Video Solution

27. Let $y = f(x)$ be the function, which passes through (1, 2) and has slope $2x + 1$, then the area bounded between the curve $x = 1$ and x-axis (in square unit) is-

A. 6

B. $\frac{4}{3}$

C. $\frac{1}{6}$

D. $\frac{5}{6}$

Answer: C

Watch Video Solution

28. The radius of a cylinder is increasing at the rate of 3 m/s and its altitude is decreasing at the rate of 4m/s. The rate of change of volume (m^3/s) when radius is 4 m and altitude 6 m is -

A. 144π

B. 80

C. -80π

D. 80π

Answer: D

Watch Video Solution

29. The function $f(x) = x^2 + 4x - 2$ has a minimum value at-

A. $x = 3$

B. $x = 2$

C. $x = -2$

D. $x = -3$

Answer: C

Watch Video Solution

30. The normal at any point to a curve always passes through a given point (a, b) , if the curve passes through the origin, then the curve is a/an -

A. circle

B. ellipse

C. parabola

D. hyperbola

Answer: A

Watch Video Solution

Question Paper 8

1. If the line $y = 2x + k$ is a tangent to the curve $x^2 = 4y$, then the value of k is -

A. 4

B. $\frac{1}{2}$

C. -4

D. $-\frac{1}{2}$

Answer: C

Watch Video Solution

2. The are (in square unit) bounded by the parabola $x^2 = 16y$, y-axis and its latus rectum is

-

A. $\frac{32}{3}$

B. $\frac{64}{3}$

C. $\frac{128}{3}$

D. $\frac{16}{3}$

Answer: B

Watch Video Solution

3. The tangent drawn at the point (0, 1) on the curve $y = e^{2x}$ meets the x-axis at the point -

A. (0, 0)

B. (2, 0)

C. $\left(\frac{1}{2}, 0\right)$

D. $\left(-\frac{1}{2}, 0\right)$

Answer: D

Watch Video Solution

4. The area (in square unit) bounded by the curve $f(x) = 4 - |x|$ and the x-axis is -

A. 16

B. 32

C. 12

D. 24

Answer: A

Watch Video Solution

5. If the area bounded by the parabola $y = x - x^2$ and the line $y = mx$ is $\frac{9}{2}$ square unit, then one value of m is -

A. 1

B. 2

C. 3

D. 4

Answer: D

Watch Video Solution

6. The point of intersection of the tangents to the parabola $y^2 = 4ax$ at the points t_1 and t_2 is -

A. $\{2at_1t_2, a(t_1 + t_2)\}$

B. $\{2at_1t_2, 2a(t_1 + t_2)\}$

C. $\{at_1t_2, a(t_1 + t_2)\}$

D. none of these

Answer: C

Watch Video Solution

7. The locus of the point of intersection of two perpendicular tangents to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ is -

A. $x^2 + y^2 = 5$

B. $x^2 + y^2 = 13$

C. $x^2 + y^2 = 4$

D. $x^2 + y^2 = 9$

Answer: B

Watch Video Solution

8. If the area bounded by the parabola $y=2-x^2$ and the line $x+y=0$ is A square unit, then the value of A is -

A. $\frac{9}{2}$

B. $\frac{2}{9}$

C. $\frac{1}{3}$

D. $\frac{7}{3}$

Answer: A

Watch Video Solution

9. The angle between the tangents drawn from the point $(1, 4)$ to the parabola $y^2 = 4x$ is -

A. $\frac{\pi}{2}$

B. $\frac{\pi}{6}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{3}$

Answer: D

Watch Video Solution

10. The area (in square unit) of the region bounded by the curve $y = |x - 2|$, x-axis and the ordinates x=1, x=3 is -

A. 4

B. 3

C. 2

D. 1

Answer: D

Watch Video Solution

11. If the line $2x + \sqrt{6}y = 2$ is a tangent to the hyperbola $x^2 - 2y^2 = 4$, then the coordinates of the point of contact are -

A. $\left(4, \ -\sqrt{6}\right)$

B. $\left(7, \ -2\sqrt{6}\right)$

C. $(2, 3)$

D. $\left(\sqrt{6}, 1\right)$

Answer: A

Watch Video Solution

12. The equation of the normal to the curve $x^3 + y^3 = 8xy$ at the point where it meets the parabola $y^2 = 4x$ is -

A. $x + y = 0$

B. $x - y = 0$

C. $x - y + 4 = 0$

D. $x + y + 4 = 0$

Answer: B

Watch Video Solution

13. The curve $x=1-3t^2, y=t-3t^3$ is symmetrical with respect to -

A. both axes

B. y-axis

C. x-axis

D. none of these

Answer: C

Watch Video Solution

14. The equation of the curve in which the portion of the tangent between the coordinate axes is bisected at the point of contact is a/an-

A. ellipse

B. rectangular hyperbola

C. hyperbola

D. parabola

Answer: B

Watch Video Solution

15. The equation of the normal to the parabola $y^2 = 5x$. Which makes an angle of 45° with the x-axis is -

A. $x - y = 15$

B. $2(x - y) = 15$

C. $4(x - y) = 15$

D. $8(x - y) = 15$

Answer: C

Watch Video Solution

16. The maximum value of $Z = 3x + 4y$ subject to the constraints $x + y \leq 40$, $x + 2y \leq 60$, $x \geq 0$ and $y \geq 0$ is -

A. 140

B. 120

C. 100

D. 80

Answer: A

Watch Video Solution

17. The minimum value of $\frac{1}{2}(7 - \cos 2x)$ is -

A. $\frac{7}{2}$

B. 4

C. $\frac{5}{2}$

D. 3

Answer: D

Watch Video Solution

18. If $g(x) = \min\left(x, x^2\right)$ where x is a real number then -

A. g(x) is a decreasing function

B. g(x) is an increasing function

C. g(x) is a constant function

D. The function g(x) is neither decreasing nor increasing

Answer: B

Watch Video Solution

19. The value of a so that the sum of the squares of the roots of the equation $x^2 - (a-2)x + 1 - a = 0$ assumes the least value is -

A. 3

B. 2

C. 1

D. -1

Answer: C

Watch Video Solution

20. Twenty metres are available to fence a land in the form of a circular sector. If the land should have the greatest possible surface area, then the the radius of the circle must be -

A. 5 m

B. 4 m

C. 6 m

D. 3 m

Answer: A

Watch Video Solution

21. Area (in square unit) of the greatest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is -

A. $\sqrt{ab}$

B. $\frac{a}{b}$

C. ab

D. 2ab

Answer: D

Watch Video Solution

22. The point on the parabola $2y = x^2$, which is nearest to the point (0, 3) is -

A. $(\pm 4, 8)$

B. $\left(\pm 1, \frac{1}{2}\right)$

C. $(\pm 2, 2)$

D. $\left(\pm 3, \frac{9}{2}\right)$

Answer: C

Watch Video Solution

23. Let $f(x)$ be a differentiable function. If

$$h(x)=\frac{1}{3}\{f(x)\}^3+\{f(x)\}^2+f(x)+\frac{1}{3}$$

then which one of the following is correct ?

A. h(x) increases as f(x) decreases

B. h(x) increases as f(x) increases

C. h(x) always increases whether f(x) increases or decreases

D. nothing definite can be said

Answer: B

Watch Video Solution

24. What is the value of b for which the function $f(x) = \sin x - bx + c$ is decreasing in the interval $(-\infty, \infty)$?

A. $b > 1$

B. $b \geq 1$

C. $b < 1$

D. $b \leq 1$

Answer: A

Watch Video Solution

25. The radius of a circular plate is increasing at the rate of 0.01 cm/s when the radius is 12 cm. Then the rate at which the area (in cm^2 / s) increases is -

A. 0.25π

B. 0.60π

C. 1.2π

D. 0.24π

Answer: D

Watch Video Solution

26. A spherical balloon is being inflated at the rate of 35 cm^3/min. Then the rate of increase of the surface area (in cm^2/min) of the balloon when its diameter is 14 cm, is -

A. 7

B. 10

C. 17.5

D. 28

Answer: B

Watch Video Solution

27. Electric current C, measured by a galvanometer, is given by the equation $C = k \tan \theta$, where k is constant. Then the percentage error in the current corresponding to an error 0.7 percent in the measurement of θ when $\theta = 45^{\circ}$ is -

A. 1.4

B. 2.8

C. 1.1

D. 2.2

Answer: C

Watch Video Solution

28. The value of Var $(4x+3)$ is

A. 16 Var (x)

B. 4 Var (x)

C. 12 Var (x)

D. 16 Var (x)+9

Answer: A

Watch Video Solution

29. If the side of an equilateral triangle increases at the rate of $\sqrt{3}$ cm/s and its area at the rate of 12 cm^2 / s, then the length (in cm) of a side of the triangle is -

A. 4

B. 6

C. 8

D. 16

Answer: C

Watch Video Solution

30. If $y = 3x^2 + 2$ and if x changes from 10 to 10.1, then the approximate change in y will be -

A. 4

B. 6

C. 5

D. 8

Answer: B

Watch Video Solution