



SNS COLLEGE OF TECHNOLOGY



(AN AUTONOMOUS INSTITUTION)
COIMBATORE-35

DEPARTMENT OF MATHEMATICS

Mathematics /Unit III/ Differential Calculus

PART – C

Level – 1 Questions

1. Find the radius of curvature for the curve $x^3 + y^3 = 3axy$.
2. Find the radius of curvature for the curve $\sqrt{\frac{x}{a}} + \sqrt{\frac{y}{b}} = 1$ at any point (x, y) .
3. Find ρ for the curve $y^2 = x^3 + 8$ at $(-2, 0)$.
4. Show that the radius of curvature of the hypocycloid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ at any point (a, b) is $3(abc)^{\frac{1}{3}}$.
5. Find the radius of curvature of the curve $x = a \cos \theta, y = a \sin \theta$ at $\theta = \frac{\pi}{4}$.
6. Find the radius of curvature at $(a, 0)$ on the curve $y^2 = a^3 - x^3$.
7. Find ρ for the curve $x = 6t^2 - 3t^4, y = 8t^3$ at the point .

Level – 2 Questions

8. Find the centre and circle of curvature of the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at $(\frac{a}{4}, \frac{a}{4})$.
9. Find the circle of curvature of the curve $x^3 + y^3 = 3axy$ at the point $(\frac{3a}{2}, \frac{3a}{2})$.
10. Find the envelope of the family of straight lines $x \cos \theta + y \sin \theta = a \sec \theta$, θ being the parameter.
11. Find the centre of curvature of $y = x^2$ at the origin.
12. Find the circle of curvature at the point $(1, 1)$ on the curve $x^3 + y^3 = 2$.
13. Find the equation of the circle of curvature of the parabola $y^2 = 12x$ at the point $(3, 6)$.
14. Show that the radius of curvature ρ at any point (x, y) on the curve $y = \frac{ax}{a+x}$ satisfies $(\frac{2\rho}{a})^{\frac{2}{3}} = (\frac{x}{y})^{\frac{2}{3}} + (\frac{y}{x})^{\frac{2}{3}}$.
15. Find the radius of curvature of the curve $xy^2 = a^3 - x^3$ at $(a, 0)$.

Level – 3 Questions

16. Find the evolute of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
17. Find the evolute of the rectangular hyperbola $xy = c^2$.
18. Show that the evolute of the cycloid $x = a(\theta - \sin \theta), y = a(1 - \cos \theta)$ is another cycloid.
19. Find the evolute of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.
20. Find the equation of the evolute of the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$.
21. Find the equation of the evolute of the parabola $y^2 = 4ax$.
22. Show that the evolute of the curve $x = a(\cos \theta + \theta \sin \theta), y = a(\sin \theta - \theta \cos \theta)$ is a circle.
23. Obtain the evolute of the parabola $x^2 = 4ay$

