Curvature

Question Bank

Engineering Mathematics-II (B.tech)

1. Prove that the chord of the curvature through the pole for: $r^m = a^m \cos m\theta$ is $\frac{2r}{m+1}$.
2. Find the pedal equation of the parabola $y^2 = 4ax$
3. Find the radius of curvature at the origin for the curve:
   $y^2 - 3xy - 4x^2 + x^3 + x^4 y + y^5 = 0$
4. For the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, show that the coordinates of the centre of curvature (x , y) are:

   $x = \frac{a^2 - b^2}{a^4} x^3$ and $y = \frac{b^2 - a^2}{b^4} y^3$
5. Show that radius of curvature at any point (x , y) of the hypocycloid $x^{2/3} + y^{2/3} = a^{2/3}$ is three times the length of perpendicular from the origin to the tangent at (x, y).
6. Find the radius of curvature at the origin for the curve:
   $x^3 + y^2 - 2x^2 + 6y = 0$
7. Find the radius of curvature for : $r = a(1 + \cos\theta)$
8. Find the radius of curvature for: $x = a(\cos t + t \sin t),\ y = a(\sin t - t \cos t)$
9. Show that chord of the curvature through the pole for the curve $p = f(r)$:

   Chord ¿ $2p\frac{dr}{dp} = 2\frac{f(r)}{f'(r)}$
10. For the parabola $y^2 = 4ax$, *prove that* : $x = 2a + 3x,\ y = -2\frac{x^{3/2}}{a^{1/2}}$
11. Find the radius of curvature for : $r^m = a^m \cos m\theta$
12. Find the pedal equation of the cardioid : $r = a(1 - \cos\theta)$
13. Find the chord of curvature through the pole of the curve $r^n = a^n \cos n\theta$
14. Find the centre of curvature at the point on the ellipse $x = a\cos t,\ y = b \sin t$
15. Find the radius of curvature for the curve $x^3 + y^3 = 3axy$ at the point ($\frac{-3a}{2}, \frac{3a}{2}$ ¿

16. Find the radius of curvature of the curve: $r = a\sin n\theta$ at the origin.

17. For the curve : $r^m = a^m \cos m\theta$ prove that ρ ¿ $\frac{a^m}{(m+1)r^{m-1}}$

18. Find the radius of curvature at the vertex of the cycloid : $x = a(\theta + \sin\theta), y = a(1 - \cos\theta)$

19. Show that the pedal equation of the curve : $r^n = a^n \sin n\theta$ is P $a^n = r^{n+1}$

20. Find the radius of curvature at the origin for the curve :
$x^3 - 2x^2 y + 3x y^2 - 4y^3 + 5x^2 - 6xy + 7y^2 - 8y = 0$

21. Prove that the chord of the curve through the pole for the curve $r = a e^{m\theta}$ is 2r

22. Find the centre of curvature for the curve $y = 3x^3 + 2x^2 - 3$ at (0 , -3)

23. Find the radius of curvature for: $r = a(1 - \cos\theta)$

24. A curve is given by $x = a\sin\theta, y = b\cos 2\theta$ find the radius of curvature at θ ¿ $\frac{\pi}{3}$

25. For the curve $y = \frac{ax}{a+x}$ if ρ is the radius of the curvature at any point (x , y) show that :

$$\left(\frac{2\rho}{a}\right)^{\frac{2}{3}} = \left(\frac{y}{x}\right)^2 + \left(\frac{x}{y}\right)^2$$

26. Find the radius of curvature at the origin for the curve :
$2x^4 + 2y^4 + 4x^2 y + xy - y^2 + 2x = 0$

27. Find the pedal equation of the parabola: $y^2 = 4a(x + a)$

28. Find the radius of curvature for : $r = a\cos\theta$

29. Find the radius of curvature for: $r = a(\cos\theta + 1)$

30. Show that the chord of the curvature through the pole of the cardiode : $r = a(1 + \cos\theta)$ $is \frac{4}{3} r$

Mr.Shaikh Zameer H.

“

Asst.Prof.Shaikh Zameer H.