

Topics : Application of Derivatives, Circle

Type of Questions

M.M., Min.

Single choice Objective (no negative marking) Q.1

(3 marks, 3 min.)

[3, 3]

Subjective Questions (no negative marking) Q.2,3,4,5,6,7,8

(4 marks, 5 min.)

[28, 35]

- The slope of the normal at the point with abscissa $x = -2$ of the graph of the function $f(x) = |x^2 - |x||$ is
(A) $-1/6$ (B) $-1/3$ (C) $1/6$ (D) $1/3$
- Find the equation of the straight line which is tangent at one point and normal at another point of the curve $x = 3t^2$, $y = 2t^3$.
- Let P be a point on the curve $x^2 - y^2 = a^2$, where a is a parameter, such that P is nearest to the line $y = 2x$. Find the locus of P.
- Find the acute angle between the curves $y = |x^2 - 1|$ and $y = |x^2 - 3|$ at their points of intersection.
- If $x = a \sin 2\theta (1 + \cos 2\theta)$, $y = a \cos 2\theta (1 - \cos 2\theta)$, prove that $\frac{\left\{1 + \left(\frac{dy}{dx}\right)^2\right\}^{3/2}}{(d^2y/dx^2)} = 4a \cos 3\theta$.
- For the curve $y = 4x^3 - 2x^5$, find points at which tangent passes through the origin.
- A line meets the x and y axes at A and B respectively. A circle is circumscribed about the triangle OAB. If the distance of the points A and B from the tangent at O, the origin, to the circle are m and n respectively, find the equation of the circle.
- From a point, common tangents are drawn to the circle $x^2 + y^2 = 8$ and parabola $y^2 = 16x$. Find the area of the quadrilateral formed by the common tangents, the chord of contact of the circle and the chord of contact of the parabola.

Answers Key

1. (D) 2. $y = \pm \sqrt{2} (x - 2)$ 3. $x = 2y$

4. $\theta = \tan^{-1} \left(\frac{4\sqrt{2}}{7} \right)$ 6. $(0, 0), (1, 2), (-1, -2)$

7. $x^2 + y^2 \pm \sqrt{m(m+n)} x \pm \sqrt{n(n+m)} y = 0$

8. 60