APPLICATIONS OF DERIVATIVES

TANGENTS & NORMALS

EXERCISE

Q.1 Find the slope of the normal to the curve $x = 1 - a \sin\theta$, $y = b \cos^2\theta$ at $\theta = \frac{\pi}{2}$.

Q.2 Find the equation of the tangent and normal to the given curves at the given points.

(i) $y = x^4 - 6x^3 + 13x^2 - 10x + 5$ at $(1, 3)$

(ii) $y^2 = \frac{x^3}{4 - x}$ at $(2, -2)$.

Q.3 Prove that area of the triangle formed by any tangent to the curve $xy = c^2$ and coordinate axes is constant.

Q.4 A curve is given by the equations $x = at^2$ & $y = at^3$. A variable pair of perpendicular lines through the origin 'O' meet the curve at P & Q . Show that the locus of the point of intersection of the tangents at P & Q is $4y^2 = 3ax - a^2$.

Q.5 How many tangents are possible from $(1, 1)$ to the curve $y - 1 = x^3$. Also find the equation of these tangents.

Q.6 Find the equation of tangent to the hyperbola $y = \frac{x + 9}{x + 5}$ which passes through $(0, 0)$ origin

Q.7 For the curve $x^{m+n} = a^{m-n} y^{2n}$, where a is a positive constant and m, n are positive integers, prove that the m^{th} power of subtangent varies as n^{th} power of subnormal.

Q.8 Prove that the segment of the tangent to the curve $y = \frac{a}{2} \lambda n \frac{a + \sqrt{a^2 - x^2}}{a - \sqrt{a^2 - x^2}} - \sqrt{a^2 - x^2}$ contained between the y-axis & the point of tangency has a constant length .

Q.9 Find the length of the subnormal to the curve $y^2 = x^3$ at the point $(4, 8)$.

ANSWER KEY

1. $-\frac{a}{2b}$

2. (i) Tangent : $y = 2x + 1$, Normal : $x + 2y = 7$

   (ii) Tangent : $2x + y = 2$, Normal : $x - 2y = 6$

5. $y = 1$, $4y = 27x - 23$

6. $x + y = 0$; $25y + x = 0$

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