Past Examination Questions

Tangents and Normals

Part 4

1. Show that the tangents to the curve $y^2 = 2y + 8x - 17$ at the points where $x = 4$ are perpendicular. (N86/P2/6b)

2. Show that the equation of the normal to the curve $y = 2x + \frac{6}{x}$ at the point (2, 7) is $y + 2x = 11$. Given that this normal meets the curve again at P, find the x co-ordinate of P. (J87/P1/9)

3. Given that $y = \frac{\sqrt{x}}{x-2}$, prove that $\frac{dy}{dx} = -\frac{x+2}{2\sqrt{x}\,(x-2)^2}$. Hence obtain the equation of the normal to the curve $y = \frac{\sqrt{x}}{x-2}$ at the point on the curve where $x = 4$. (J87/P2/6c)

4. Find the equation of the normal to the curve $y = 2x^2 - 1$ at the point $\left(\frac{1}{2}, -\frac{1}{2}\right)$. (J88/P1/2)

5. Find the equation of the normal to the curve $y = \frac{4x+1}{x-1}$ at the point where $y = 5$. (N88/P2/6b)

6. P is the point (3, 4) on the curve $y = 3x^2 - 12x + 13$. Find the co-ordinates of the point of intersection of the normal to the curve at P with the line $x + 3 = 0$. (N89/P1/2)

7. Find the equation of the normal to the curve $x^2 + y^2 = 2x + 5y + 2$ at each of the two points where $x = 4$. (N89/P2/5b)

8. The tangent to the curve $y = x^2 - 6x + 11$ at $P(2, 3)$ meets the y-axis at A and the x-axis at B. Find (i) the equation of the tangent, (ii) the area of the triangle AOB, where O is the origin, (iii) the ratio $AP:PB$. (J90/P1/2)

9. Calculate the co-ordinates of the point on the curve $y = 2x^2 - 3x + 2$ at which the gradient of the curve is 5. Calculate the value of the constant k for which $y = 5x + k$ is a tangent to the curve. (J91/P1/2)

10. Find the equation of the tangent to the curve $y^2 - 8x - 2y + 13 = 0$ at (2, 3). (J91/P2/6c)

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

3. $8x - 3y - 29 = 0$

4. $2x + 4y + 1 = 0$

5. $y = 5x - 25$

6. $(-3, 5)$

7. $x + 6y = 16$, $6y - x = 14$

8. (i) $y + 2x = 7$

   (ii) $12\frac{1}{4}$ units^2

9. $(2, 4)$, -6

10. $y = 2x - 1$