

C4 Parametrics Proving Results

Mostly taken from the OCR C4 textbook.

- A curve is given parametrically by the equations $x = t^2, y = t + 1$.

 - Find $\frac{dy}{dx}$ in terms of t and find the equation of the tangent at the point with parameter t . $x - 2ty + t^2 + 2t = 0$
 - Find the cartesian equation of the curve. $x = y^2 - 2y + 1$
- A curve is given parametrically by the equations $x = t^2 + t, y = t^2 - t$.

 - Find $\frac{dy}{dx}$ in terms of t and find the equation of the normal at the point with parameter t . $4t^3 + 2t = (2t + 1)x + (2t - 1)y$
 - Find the cartesian equation of the curve. $2(x + y) = (x - y)^2$
- Find the equation of the tangent at $(-8, 4)$ to the curve which is given parametrically by $x = t^3, y = t^2$. $x + 3y = 12$
 - Find the value of the parameter where this tangent meets the curve again. $t = 1$
 - Find the cartesian equation of the curve. $y^3 = x^2$
- Let P be the point on the curve $x = t^2, y = \frac{1}{t}$ with coordinates $(p^2, \frac{1}{p})$.

 - Find the equation of the tangent at P . $x + 2p^3y = 3p^2$
 - This tangent meets the x and y -axes at A and B respectively. Find the coordinates of both points. $A(3p^2, 0), B(0, \frac{3}{2p})$
 - Prove that $PA = 2BP$.
- A parabola is given parametrically by $x = at^2, y = 2at$. P is the point $(ap^2, 2ap)$.

 - The foot of the perpendicular from P onto the axis of symmetry is F . Find the coordinates of F . $(ap^2, 0)$
 - Find the equation of the normal to the parabola at P . $px + y = ap^3 + 2ap$
 - G is the point where the normal from P crosses the axis of symmetry. Find the coordinates of G . $(ap^2 + 2a, 0)$
 - Prove that $FG = 2a$.
- Let H be the curve with parametric equations $x = t, y = \frac{1}{t}$, and let P be the point on H with parameter p .

 - Find the equation of the tangent at P . $x + p^2y = 2p$
 - The tangent at P meets the x -axis at T . Find the coordinates of T . $(2p, 0)$
 - Prove that $OP = PT$, where O is the origin. $OP = PT = \sqrt{\frac{p^4 + 1}{p^2}}$
- For the curve
$$x = 4at^2, \quad y = \frac{t}{a}$$
 find the equation of the tangent when $t = p$. $8a^2py = x + 4ap^2$
 - This tangent crosses the x -axis at A and the y -axis at B . Find the area of the triangle OAB where O is the origin. p^3