



STEP III, 2001 Q5

- 5 Show that the equation $x^3 + px + q = 0$ has exactly one real solution if $p \geq 0$.

A parabola C is given parametrically by

$$x = at^2, \quad y = 2at \quad (a > 0) .$$

Find an equation which must be satisfied by t at points on C at which the normal passes through the point (h, k) . Hence show that, if $h \leq 2a$, exactly one normal to C will pass through (h, k) .

Find, in Cartesian form, the equation of the locus of the points from which exactly two normals can be drawn to C . Sketch the locus.



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