6. The parabola C has equation $y^2 = 36x$

The point $P(9t^2, 18t)$, where $t \neq 0$, lies on C

(a) Use calculus to show that the normal to C at P has equation

$$y + tx = 9t^3 + 18t$$

(4)

(b) Hence find the equations of the two normals to C which pass through the point (54, 0), giving your answers in the form $y = px + q$ where p and q are constants to be determined.

(4)

Given that

- the normals found in part (b) intersect the directrix of C at the points A and B
- the point F is the focus of C

(c) determine the area of triangle AFB

(3)

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