

The parametric equations of a curve are

$$x = te^{2t}, \quad y = t^2 + t + 3.$$

(a) Show that $\frac{dy}{dx} = e^{-2t}$. [3]

(b) Hence show that the normal to the curve, where $t = -1$, passes through the point $\left(0, 3 - \frac{1}{e^4}\right)$. [3]