13.

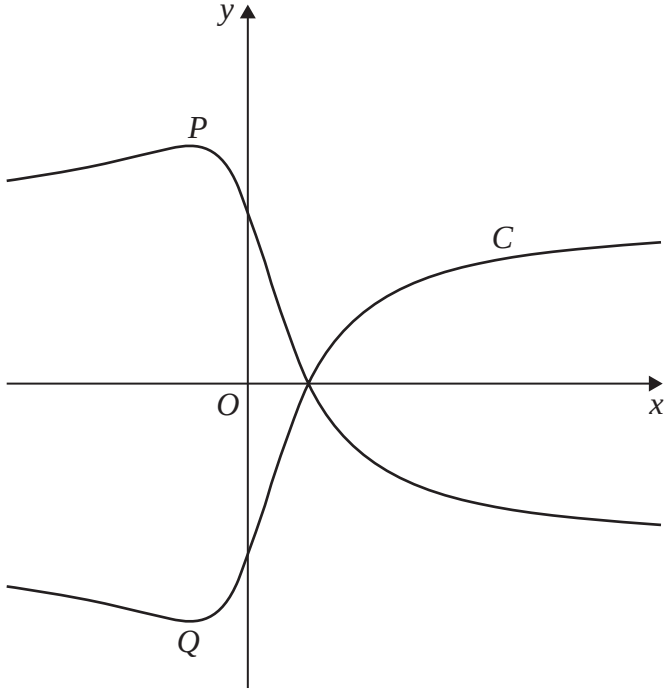

Figure 7

Figure 7 shows a sketch of part of the curve C with parametric equations

$$x = \tan t \qquad y = 4\sin\left(t - \frac{\pi}{4}\right) \qquad 0 \leqslant t < 2\pi$$

(a) Using parametric differentiation, find an expression for $\dfrac{\mathrm{d}y}{\mathrm{d}x}$

(2)

Given that C has a maximum turning point at P and a minimum turning point at Q

(b) (i) show that the x coordinate of both P and Q is -1

(ii) Hence find the coordinates of P and Q

(3)

(c) (i) Show that $y = \dfrac{2\sqrt{2}(x-1)}{\sec t}$

(ii) Hence or otherwise, find a Cartesian equation for C in the form $y^2 = \mathrm{f}(x)$

(5)