

12.

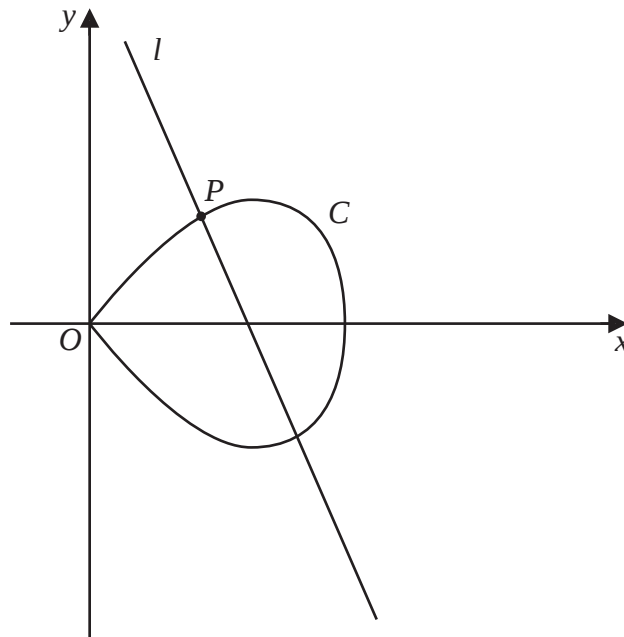


Figure 2

**In this question you must show all stages of your working.
Solutions relying entirely on calculator technology are not acceptable.**

Figure 2 shows a sketch of the curve C with parametric equations

$$x = 1 - \cos 2t \quad y = \sin t \sin 2t \quad 0 \leq t \leq \pi$$

The line l is the normal to C at the point P where $t = \frac{\pi}{4}$

(a) Find the exact coordinates of P .

(1)

(b) Using parametric differentiation, show that l has equation

$$ax + \sqrt{2}y = b$$

where a and b are constants to be found.

(6)

Given that

- l meets C again at the point Q
- all points on C satisfy the equation $2y^2 = x^2(2 - x)$

(c) find, in simplest form, the exact x coordinate of Q .
You must use algebra and show detailed reasoning.

(4)