

# 11.

# Parametric

# Equations

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5. A curve  $C$  has parametric equations

$$x = 2t - 1, \quad y = 4t - 7 + \frac{3}{t}, \quad t \neq 0$$

Show that the Cartesian equation of the curve  $C$  can be written in the form

$$y = \frac{2x^2 + ax + b}{x + 1}, \quad x \neq -1$$

where  $a$  and  $b$  are integers to be found.

(3)

(Total for Question 5 is 3 marks)









13. A curve  $C$  has parametric equations

$$x = \frac{t^2 + 5}{t^2 + 1} \quad y = \frac{4t}{t^2 + 1} \quad t \in \mathbb{R}$$

Show that all points on  $C$  satisfy

$$(x - 3)^2 + y^2 = 4 \tag{3}$$

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16.

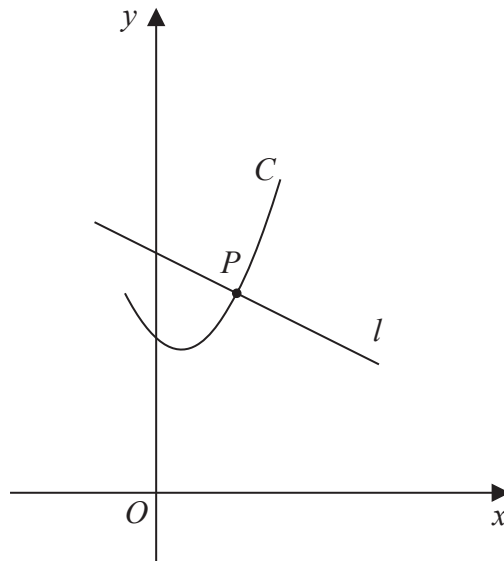


Figure 6

Figure 6 shows a sketch of the curve  $C$  with parametric equations

$$x = 2 \tan t + 1 \quad y = 2 \sec^2 t + 3 \quad -\frac{\pi}{4} \leq t \leq \frac{\pi}{3}$$

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

(a) Using parametric differentiation, show that an equation for  $l$  is

$$y = -\frac{1}{2}x + \frac{17}{2} \tag{5}$$

(b) Show that all points on  $C$  satisfy the equation

$$y = \frac{1}{2}(x - 1)^2 + 5 \tag{2}$$

The straight line with equation

$$y = -\frac{1}{2}x + k \quad \text{where } k \text{ is a constant}$$

intersects  $C$  at two distinct points.

(c) Find the range of possible values for  $k$ . (5)

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