Parametrics

1.

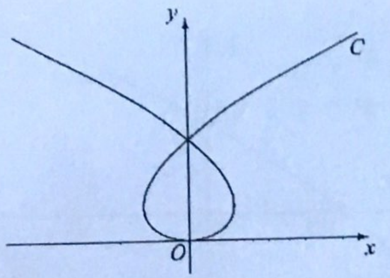


Figure 3

The curve C shown in Figure 3 has parametric equations

$$x = t^3 - 8t, \quad y = t^2$$

where t is a parameter. Given that the point A has parameter $t = -1$,

(*a*) find the coordinates of A. **(1)**

The line l is the tangent to C at A.

(*b*) Show that an equation for l is $2x - 5y - 9 = 0$. **(5)**

The line l also intersects the curve at the point B.

(*c*) Find the coordinates of B. **(6)**

[January 2009]

2.

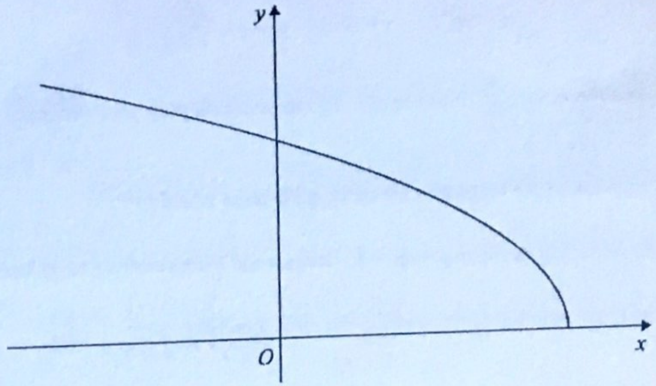


Figure 2

Figure 2 shows a sketch of the curve with parametric equations

$$x = 2\cos 2t, \quad y = 6\sin t, \quad 0 \le t \le \frac{\pi}{2}.$$

(*a*) Find the gradient of the curve at the point where $t = \frac{\pi}{3}$. **(4)**

(*b*) Find a cartesian equation of the curve in the form

$$y = \mathrm{f}(x), \quad -k \le x \le k,$$

stating the value of the constant k. **(4)**

(*c*) Write down the range of $\mathrm{f}(x)$. **(2)**

[June 2009]

3 A curve has parametric equations

$$x = \tan^2 t, \quad y = \sin t, \quad 0 < t < \frac{\pi}{2}.$$

(a) Find an expression for $\frac{dy}{dx}$ in terms of t. You need not simplify your answer.

(3)

(b) Find an equation of the tangent to the curve at the point where $t = \frac{\pi}{4}$.

Give your answer in the form $y = ax + b$, where a and b are constants to be determined.

(5)

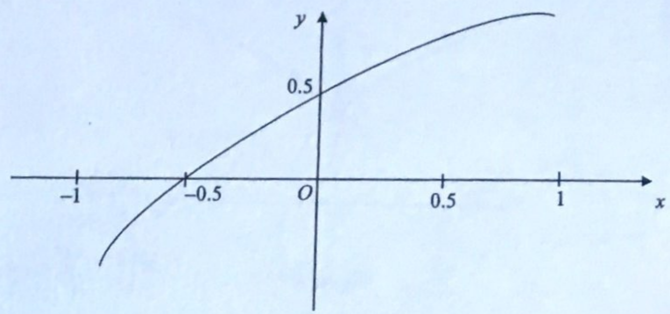
(c) Find a cartesian equation of the curve in the form $y^2 = f(x)$.

(4)

[June 2007]

4

Figure 2



The curve shown in Figure 2 has parametric equations

$$x = \sin t, \quad y = \sin\left(t + \frac{\pi}{6}\right), \quad -\frac{\pi}{2} < t < \frac{\pi}{2}.$$

(a) Find an equation of the tangent to the curve at the point where $t = \frac{\pi}{6}$.

(6)

(b) Show that a cartesian equation of the curve is

$$y = \frac{\sqrt{3}}{2}x + \frac{1}{2}\sqrt{(1 - x^2)}, \quad -1 < x < 1.$$

(3)

[June 2006]