

## Section 1: Using parametric equations

### Exercise level 2

- A curve has parametric equations  $x = 3 \cos \theta$ ,  $y = 2 \sin \theta$ .
  - Calculate values for  $x$  and  $y$  for values of  $\theta$  from 0 to  $\pi$ , at intervals of  $\frac{\pi}{12}$ .
  - Using what you know about angles greater than  $\pi$  calculate values for  $x$  and  $y$  for  $\theta$  from  $\pi$  to  $2\pi$ .
  - Sketch the curve.
  - Find the Cartesian equation of the curve.
- Given the parametric equations  $x = t - \frac{1}{t}$ ,  $y = 2\left(t + \frac{1}{t}\right)$ ,
  - For what value of  $t$  is the curve undefined?
  - Find the coordinates of any points where the curve meets the coordinate axes.
  - Find the Cartesian equation.
- Sketch the curve with parametric equations  $(2t(t^2 - 1), 4t^2)$ , using  $\frac{1}{2}$  unit values for  $t$  between  $-2$  and  $+2$ . By eliminating  $t$ , find the Cartesian equation of the curve.
- A ball is struck at ground level and projected with a speed of  $16 \text{ ms}^{-1}$  at an angle  $\theta$  to the horizontal. The parametric equations of the path of the ball are given by  $x = 16t \cos \theta$ ,  $y = 16t \sin \theta - 5t^2$ .
  - By eliminating  $t$  show that the Cartesian equation of the path can be written as a quadratic in  $\tan \theta$ .  
Given that  $\theta = 30^\circ$ ,
    - How far does the ball travel horizontally before bouncing?
    - What is the maximum height attained by the ball?