8   The curve defined by the parametric equations
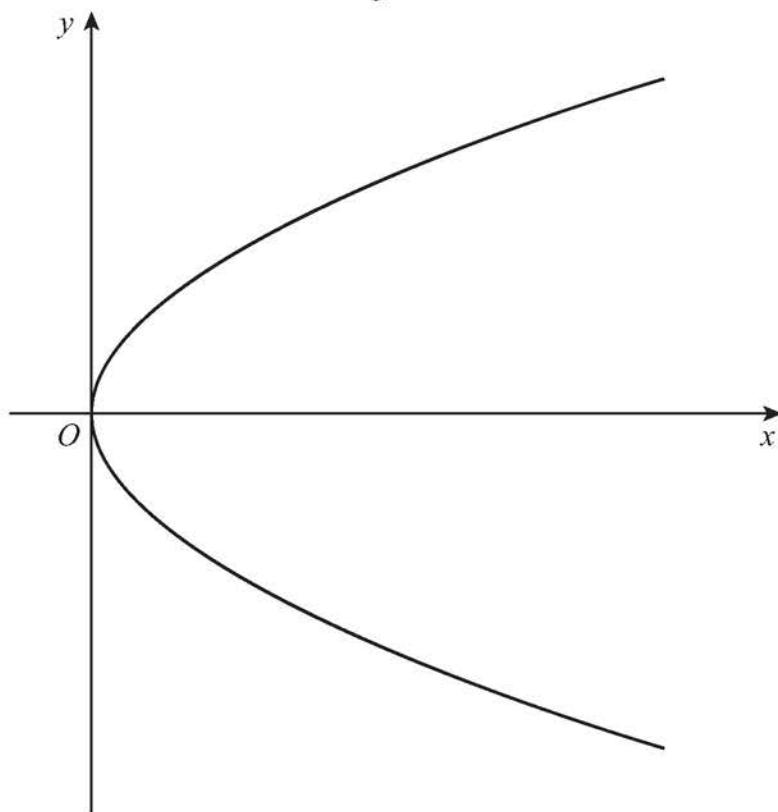
$$x = t^2 \text{ and } y = 2t \qquad -\sqrt{2} \le t \le \sqrt{2}$$

is shown in **Figure 1** below.

Figure 1

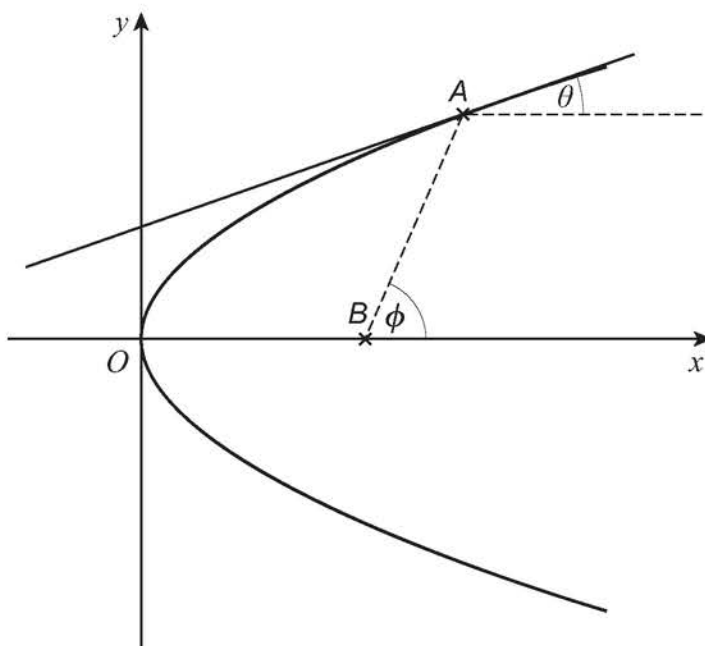**8 (a)**   Find a Cartesian equation of the curve in the form $y^2 = f(x)$

[2 marks]

8 (b)   The point A lies on the curve where $t = a$

The tangent to the curve at A is at an angle θ to a line through A parallel to the x-axis.

The point B has coordinates (1, 0)

The line AB is at an angle ϕ to the x-axis.

8 (b) (i)   By considering the gradient of the curve, show that

$$\tan \theta = \frac{1}{a}$$

[3 marks]

8 (b) (ii)   Find $\tan \phi$ in terms of a.

[2 marks]

8 (b) (iii)   Show that $\tan 2\theta = \tan \phi$

[3 marks]