

(44) Points of Intersection of Parametric Curves

WORKING AT D/E

(1) A curve has parametric equations:

$$x = 2t - 4, \quad y = t^2, \quad -6 \leq t \leq 3$$

(a) The curve crosses the y axis at A . Find the value of t at the point A .

(b) Hence, find the coordinates of A .

(c) The curve crosses the x axis at B . Find the value of t at the point B .

(d) Hence, find the coordinates of B .

(2) A curve has parametric equations:

$$x = 3t, \quad y = t^2, \quad -4 \leq t \leq 6$$

Given that the line with equation $y = x + 10$ meets the curve at two points

(a) Show that $t^2 - 3t - 10 = 0$

(b) Find the two roots of the equation $t^2 - 3t - 10 = 0$.

(c) Hence, find the coordinates where the line with equation $y = x + 10$, meets the curve with parametric equations $x = 3t, y = t^2$

(3) A circle has parametric equations:

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

Find the coordinates of the 4 points where the circle crosses the coordinate axes.

WORKING AT B/C

(1) A curve has parametric equations:

$$x = e^{3t} - 1, \quad y = \ln(t - 3), \quad t > 3$$

(a) Show that the curve doesn't intersect the y axis.

(b) Find the coordinates of where the curve crosses the x axis giving your answer in exact form.

(2) A curve has parametric equations:

$$x = e^{2t} + 1, \quad y = e^t, \quad t \in \mathbb{R}$$

The line with equation $y = x - 13$ meets the curve at the point A . Find the coordinates of A .

(3) A curve has parametric equations:

$$x = 4pt, \quad y = pt^2 - 8, \quad -2 \leq t \leq 2$$

where p is a constant.

(a) Given that the point $(8, -6)$ lies on the curve, find the value of p .

(b) The curve crosses the x axis at A and B and the y axis at C . Find the coordinates of A, B and C .

WORKING AT A*/A

(1) A curve has parametric equations:

$$x = \frac{2+t}{t-1}, \quad y = 5 + t, \quad t \in \mathbb{R}, t \neq 1$$

(a) Write down the value of a .

(b) Find the coordinates of the points where the curve crosses the coordinate axes.

(c) Explain why the line $y = 6$ does not meet the curve.

(d) Show that when line with equation $y = 10 + x$ meets the curve, $t = \frac{7 \pm \sqrt{37}}{2}$.

(2) A curve has parametric equations:

$$x = \cot 4t \quad y = \sin t, \quad \frac{\pi}{12} < t < \frac{\pi}{2}$$

Find all of the points where the curve crosses the coordinate axes giving answers to 3SF where appropriate.

(3) A curve has parametric equations:

$$x = \sec t \quad y = \cot 2t, \quad 0 < t < \frac{\pi}{2}$$

A line intersects the curve at the points where $t = \frac{\pi}{6}$ and $t = \frac{\pi}{3}$.

Find an equation of the line in cartesian form.