Pearson Edexcel

A Level Mathematics 9MA0

Unit Test

7 Parametric Equations

Time allowed: 50 **minutes**

School:

Name:

Teacher:

Question	Points	Score
1	8	
2	4	
3	8	
4	14	
5	9	
6	7	
Total:	50	

1. C has parametric equations

$$x = \frac{1+4t}{1-t}, y = \frac{2+bt}{1-t}, \quad -1 \leq t \leq 0$$

(a) Show that the cartesian equation of C is [4]

$$y = \left(\frac{2+b}{5}\right)x + \left(\frac{8-b}{5}\right)$$

over an appropriate domain.

Given that C is a line segment and that the gradient of the line is -1,

(b) show that the length of the line segment is $a\sqrt{2}$, where a is a rational number to be found. [4]

Total: 8

2. A curve C has parametric equations [4]

$$x = \sec^2(t) + 1, \quad \text{and} \quad t = 2\sin(t), \qquad -\frac{\pi}{4} \leq t \leq \frac{\pi}{4}$$

Show that a cartesian equation of C is

$$t = \sqrt{\frac{8 - 4x}{1 - x}}$$

for a suitable domain which should be stated.

3. The curve C has parametric equations

$$x = 7\sin(t) - 4, \quad \text{and} \quad y = 7\cos(t) + 3, \qquad -\frac{\pi}{2} \leq t \leq \frac{\pi}{3}$$

(a) Show that the cartesian equation of C can be written as [3]

$$(x + a)^2 + (y + b)^2 = c,$$

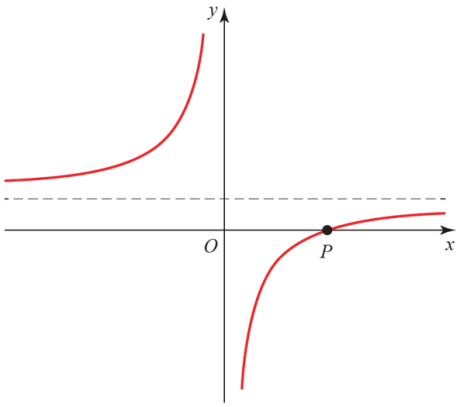
where a, b and c are integers which should be stated.

(b) Sketch the curve C on the given domain, clearly stating the endpoints of the curve. [3]

(c) Find the length of C. Leave your answer in terms of π. [2]

Total: 8

4. The diagram shows the curve C with parametric equations



$$x = t + 2, \quad \text{and} \quad y = \frac{t-1}{t+2}, \qquad t \neq -2.$$

The curve passes through the x-axis at P.

(a) Find the coordinate of P. [2]

(b) Find the cartesian equation of the curve. [2]

(c) Find the equation of the normal to the curve at the point $t = -1$. [6]

Give your answer in the form $ax + by + c = 0$.

(d) Find the coordinates of the point where the normal meets C. [4]

Total: 14

5. A stone is thrown from the top of a building. The path of the stone can be modelled using the parametric equations

$$x = 10t, \quad \text{and} \quad y = 8t - 4.9t^2 + 10, \qquad t \geq 0,$$

where x is the horizontal distance from the building in metres and y is the vertical height of the stone above the level ground in metres.

(a) Find the horizontal distance the stone travels before hitting the ground. [4]

(b) Find the greatest vertical height. [5]

Total: 9

6. A large arch is planned for a football stadium. The parametric equations of the arch are

$$x = 8(t + 10), \quad \text{and} \quad y = 100 - t^2, \qquad -10 \leq t \leq 10$$

where x and y are distances in metres.

(a) Find the cartesian equation of the arch. [3]

(b) Find the width of the arch. [2]

(c) Find the greatest possible height of the arch. [2]

Total: 7