

Write your name here	
Surname	Other names
Pearson Edexcel GCE	Centre Number Candidate Number
A level Mathematics Practice Paper Pure Mathematics - Parametric differentiation	
You must have: Mathematical Formulae and Statistical Tables (Pink)	Total Marks

Instructions

- Use black ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- Fill in the boxes at the top of this page with your name, centre number and candidate number.
- Answer all the questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided – there may be more space than you need.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet ‘Mathematical Formulae and Statistical Tables’ is provided.
- There are 5 questions in this question paper. The total mark for this paper is 40.
- The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.
- Calculators must not be used for questions marked with a * sign.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

1.

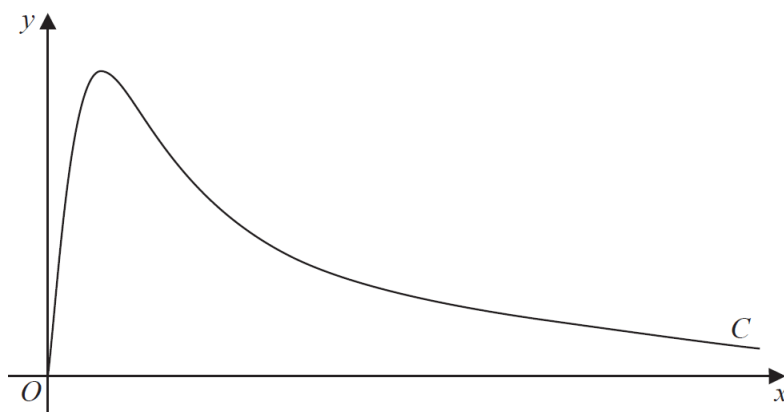


Figure 1

Figure 1 shows a sketch of the curve C with parametric equations

$$x = 4 \tan t, \quad y = 5\sqrt{3} \sin 2t, \quad 0 \leq t < \frac{\pi}{2}.$$

The point P lies on C and has coordinates $\left(4\sqrt{3}, \frac{15}{2}\right)$.

- (a) Find the exact value of $\frac{dy}{dx}$ at the point P .

Give your answer as a simplified surd.

(4)

The point Q lies on the curve C , where $\frac{dy}{dx} = 0$.

- (b) Find the exact coordinates of the point Q .

(2)

(Total 6 marks)

2. The curve C has parametric equations

$$x = 3t - 4, \quad y = 5 - \frac{6}{t}, \quad t > 0$$

- (a) Find $\frac{dy}{dx}$ in terms of t

(2)

The point P lies on C where $t = \frac{1}{2}$

- (b) Find the equation of the tangent to C at the point P . Give your answer in the form $y = px + q$, where p and q are integers to be determined.

(3)

- (c) Show that the cartesian equation for C can be written in the form

$$y = \frac{ax + b}{x + 4}, \quad x > -4$$

where a and b are integers to be determined.

(3)

(Total 8 marks)

3. A curve C has parametric equations

$$x = 4t + 3, \quad y = 4t + 8 + \frac{5}{2t}, \quad t \neq 0.$$

- (a) Find the value of $\frac{dy}{dx}$ at the point on C where $t = 2$, giving your answer as a fraction in its simplest form.

(3)

- (b) Show that the cartesian equation of the curve C can be written in the form

$$y = \frac{x^2 + ax + b}{x - 3}, \quad x \neq 3,$$

where a and b are integers to be determined.

(3)

(Total 6 marks)

4.

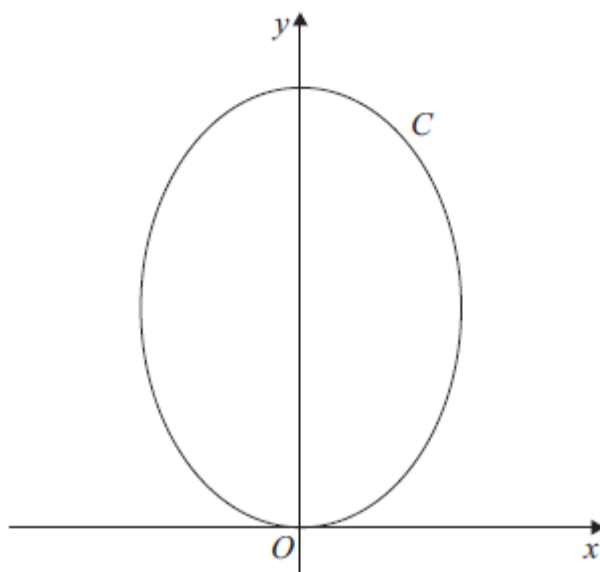


Figure 2

Figure 2 shows a sketch of the curve C with parametric equations

$$x = \sqrt{3} \sin 2t, \quad y = 4 \cos^2 t, \quad 0 \leq t \leq \pi.$$

(a) Show that $\frac{dy}{dx} = k\sqrt{3} \tan 2t$, where k is a constant to be determined.

(5)

(b) Find an equation of the tangent to C at the point where $t = \frac{\pi}{3}$.

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

(4)

(c) Find a cartesian equation of C .

(3)

(Total 12 marks)

5.

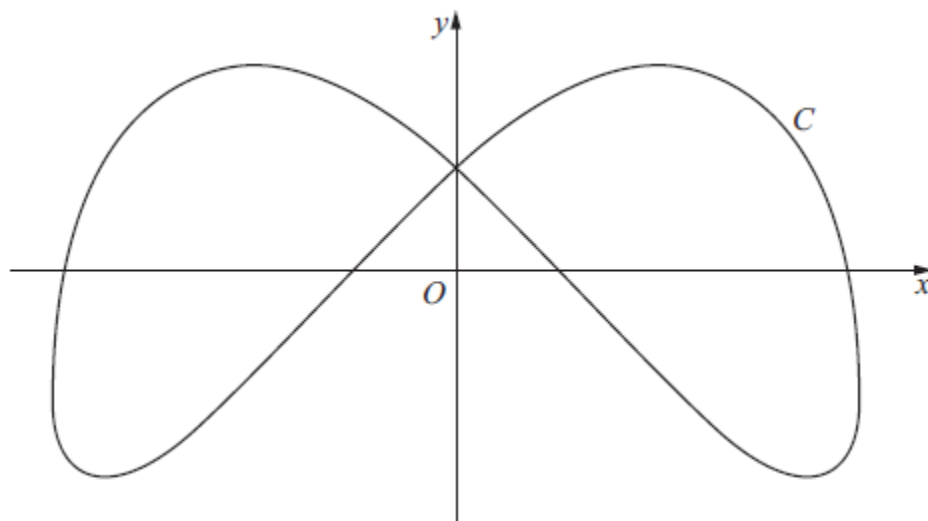


Figure 3

Figure 3 shows a sketch of the curve C with parametric equations

$$x = 4 \sin \left(t + \frac{\pi}{6} \right), \quad y = 3 \cos 2t, \quad 0 \leq t < 2\pi.$$

(a) Find an expression for $\frac{dy}{dx}$ in terms of t .

(3)

(b) Find the coordinates of all the points on C where $\frac{dy}{dx} = 0$.

(5)

(Total 8 marks)

TOTAL FOR PAPER: 40 MARKS