Write your name here

Surname	Other Names

AS/A Level Mathematics

Integration – Parametric

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

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.
- Answer **all** 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.
- Answers should be given to three significant figures unless otherwise stated.

Information

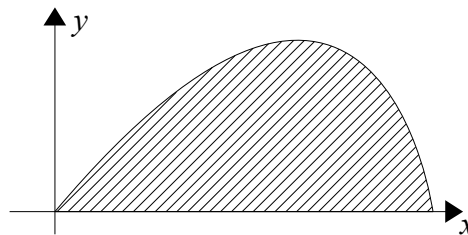- The marks for **each** question are shown in brackets
  – use this as a guide as to how much time to spend on each question.

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.

1   The curve C has the parametric equations

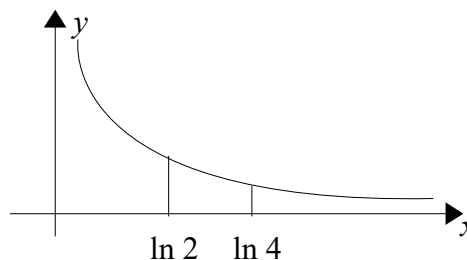$$x = 5 \cos t \qquad y = 3 \sin 2t \qquad 0 \le t \le \frac{\pi}{2}$$

(a)   Find the points where the curve meets the x axis

(3)

(b)   Find the area between the curve and the x axis

(7)

(Total for question 1 is 10 marks)

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2   The curve C has the parametric equations

$$x = \ln (t + 2) \qquad y = \frac{1}{t+1} \qquad t > -1$$
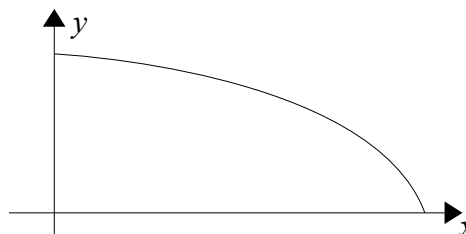

The finite region R between by the curve C and the x axis is bounded by the the lines with equations $x = \ln 2$ and $x = \ln 4$

(a)   Show that the area of R is given by the integral $\displaystyle\int_{0}^{2} \frac{1}{(t+1)(t+2)} \, dt$

(4)

(b)   Hence find an exact value for this area

(6)

(Total for question 2 is 10 marks)

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3   The curve C has the parametric equations

$$x = 3 \cos 2t \qquad y = 3 \sin t \qquad 0 \le t \le \frac{\pi}{4}$$

The finite region R between the curve C and the x axis.

(a)   The point P is where the curve meets the x axis. Find the coordinates of P.

(2)

(b)   Show that the area of R is given by the integral $\displaystyle\int_{0}^{\frac{\pi}{4}} 36 \sin^2 t \cos t \ dt$

(5)

(c)   Hence find an exact value for the area

(5)

(Total for question 3 is 12 marks)