Write your name here

Surname	Other Names

AS/A Level Mathematics

Parametric Equations

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 A curve has the parametric equations

$$x = t + 2, \qquad y = t^2 + 3$$

(a) Find a cartesian equation for the curve. **(3)**

(b) Sketch the curve **(3)**

(Total for question 1 is 6 marks)

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2 A curve has the parametric equations

$$x = 2t + 1, \qquad y = t^2 - 1$$

(a) Find the points where the curve crosses the coordinate axes. **(2)**

(b) Find an expression for $\frac{dy}{dx}$ in terms of x. **(3)**

(Total for question 2 is 5 marks)

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3 A curve has the parametric equations

$$x = \tan^2 t, \qquad y = \cos t, \qquad 0 < t < \frac{\pi}{2}$$

(a) Find an expression for $\frac{dy}{dx}$ in terms of t. **(3)**

(b) Find an equation of the tangent to the curve when $t = \frac{\pi}{4}$ **(5)**

(c) Find a cartesian equation for the curve. **(4)**

(Total for question 3 is 12 marks)

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4 A curve has the parametric equations

$$x = \sin^2 t, \qquad y = \sin 2t, \qquad 0 < t < \pi$$

(a) Find an expression for $\frac{dy}{dx}$ in terms of t. **(3)**

(b) Find an equation of the normal to the curve when $t = \frac{\pi}{6}$ **(5)**

(c) Find a cartesian equation for the curve. **(4)**

(Total for question 4 is 12 marks)

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5 A curve has the parametric equations

$$x = \ln (t + 1), \qquad y = t^2 - 5, \qquad t > -1$$

(a) Find the points where the curve crosses the coordinate axes. **(2)**

(b) Find an equation for the tangent to the curve when $t = 3$. **(5)**

(Total for question 5 is 7 marks)