Write your name here

Surname	Other Names

AS/A Level Mathematics

Differentiation – Trig

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 Use the derivatives of sin(x) and cos(x) to show that:

(a) $\frac{\mathrm{d}}{\mathrm{d}x}(\tan x) = \sec^2 x$ **(3)**

(b) $\frac{\mathrm{d}}{\mathrm{d}x}(\sec x) = \sec x \tan x$ **(3)**

(c) $\frac{\mathrm{d}}{\mathrm{d}x}(\cot x) = -\operatorname{cosec}^2 x$ **(3)**

(d) $\frac{\mathrm{d}}{\mathrm{d}x}(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x$ **(3)**

(Total for question 1 is 12 marks)

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2 Differentiate with respect to x,

(a) $x^2 \cos 2x$ **(3)**
(b) $3 \sin (2x + 1)$ **(2)**

(Total for question 2 is 5 marks)

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3 Differentiate with respect to x,

(a) $e^{3x} (\cos 2x + \sin x)$ **(3)**
(b) $\ln (\sin x)$ **(3)**

(Total for question 3 is 6 marks)

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4 The curve C has the equation $x = 2 \tan y$

(a) Find $\frac{\mathrm{d}x}{\mathrm{d}y}$ in terms of y **(2)**

(b) Hence find $\frac{\mathrm{d}y}{\mathrm{d}x}$ in terms of x **(4)**

(Total for question 4 is 6 marks)

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5 The point P lies on the curve with equation $y = \operatorname{cosec} x + \cos 2x$ with x coordinate $\frac{\pi}{4}$

Find an equation to the tangent to the curve at the point P.

(Total for question 5 is 6 marks)

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6 The point P lies on the curve with equation $y = \sec 2x$ with x coordinate $\frac{\pi}{6}$

Find an equation to the normal to the curve at the point P.

(Total for question 6 is 6 marks)
