

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	



General Certificate of Education
Advanced Level Examination
June 2011

Mathematics

MPC3

Unit Pure Core 3

Monday 13 June 2011 9.00 am to 10.30 am

For this paper you must have:

- the blue AQA booklet of formulae and statistical tables.

You may use a graphics calculator.

Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Write the question part reference (eg (a), (b)(i) etc) in the left-hand margin.
- You must answer the questions in the spaces provided. Do not write outside the box around each page.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.

Advice

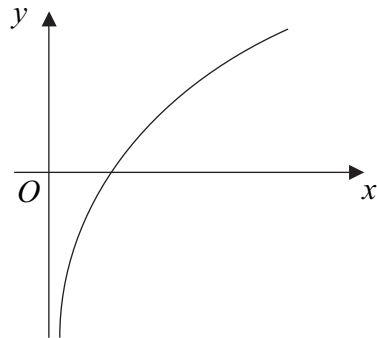
- Unless stated otherwise, you may quote formulae, without proof, from the booklet.



J U N 1 1 M P C 3 0 1

Answer **all** questions in the spaces provided.

- 1** The diagram shows the curve with equation $y = \ln(6x)$.



- (a)** State the x -coordinate of the point of intersection of the curve with the x -axis. (1 mark)
- (b)** Find $\frac{dy}{dx}$. (2 marks)
- (c)** Use Simpson's rule with 6 strips (7 ordinates) to find an estimate for $\int_1^7 \ln(6x) dx$, giving your answer to three significant figures. (4 marks)

QUESTION
PART
REFERENCE



- 3** The curve $y = \cos^{-1}(2x - 1)$ intersects the curve $y = e^x$ at a single point where $x = \alpha$.
- (a)** Show that α lies between 0.4 and 0.5. *(2 marks)*
- (b)** Show that the equation $\cos^{-1}(2x - 1) = e^x$ can be written as $x = \frac{1}{2} + \frac{1}{2}\cos(e^x)$. *(1 mark)*
- (c)** Use the iteration $x_{n+1} = \frac{1}{2} + \frac{1}{2}\cos(e^{x_n})$ with $x_1 = 0.4$ to find the values of x_2 and x_3 , giving your answers to three decimal places. *(2 marks)*

QUESTION
PART
REFERENCE



4 (a) (i) Solve the equation $\operatorname{cosec} \theta = -4$ for $0^\circ < \theta < 360^\circ$, giving your answers to the nearest 0.1° . *(2 marks)*

(ii) Solve the equation

$$2 \cot^2(2x + 30^\circ) = 2 - 7 \operatorname{cosec}(2x + 30^\circ)$$

for $0^\circ < x < 180^\circ$, giving your answers to the nearest 0.1° . *(6 marks)*

(b) Describe a sequence of two geometrical transformations that maps the graph of $y = \operatorname{cosec} x$ onto the graph of $y = \operatorname{cosec}(2x + 30^\circ)$. *(4 marks)*

QUESTION
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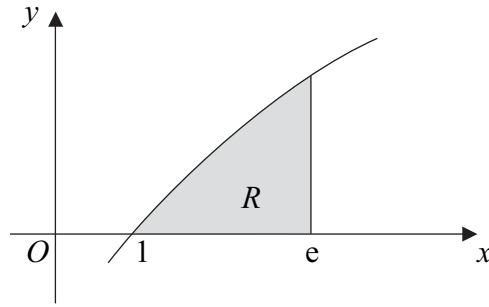
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- 9 (a) Use integration by parts to find $\int x \ln x \, dx$. (3 marks)
- (b) Given that $y = (\ln x)^2$, find $\frac{dy}{dx}$. (2 marks)
- (c) The diagram shows part of the curve with equation $y = \sqrt{x} \ln x$.



The shaded region R is bounded by the curve $y = \sqrt{x} \ln x$, the line $x = e$ and the x -axis from $x = 1$ to $x = e$.

Find the volume of the solid generated when the region R is rotated through 360° about the x -axis, giving your answer in an exact form. (6 marks)

QUESTION
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QUESTION
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END OF QUESTIONS

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