

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education  
Advanced Level Examination  
June 2010

# Mathematics

# MPC3

## Unit Pure Core 3

Friday 11 June 2010 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.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
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7	
8	
TOTAL	



J U N 1 0 M P C 3 0 1

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

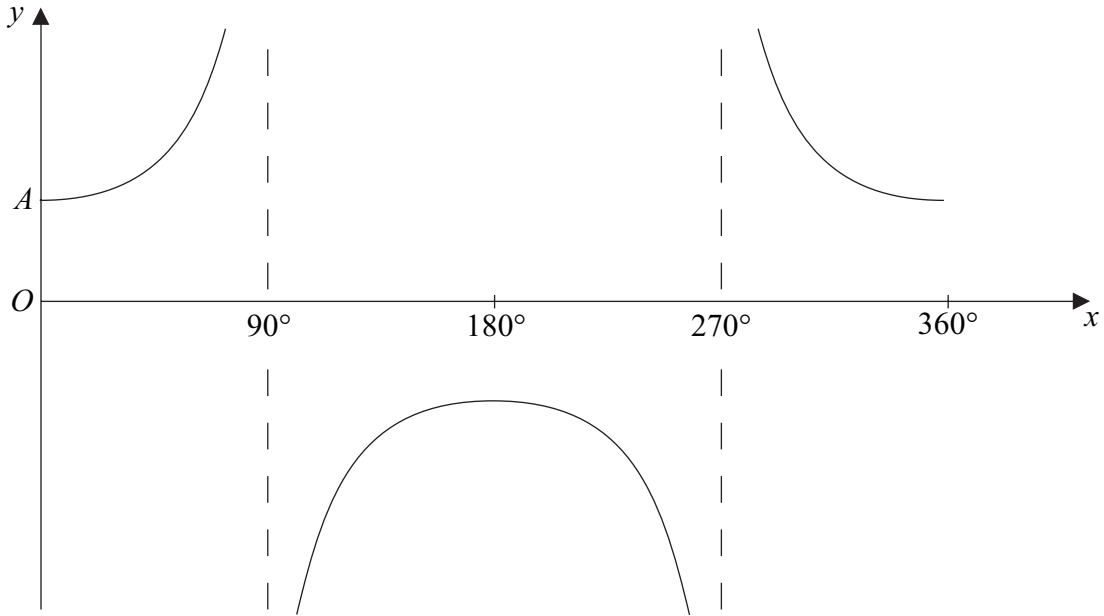
- 1** The curve  $y = 3^x$  intersects the curve  $y = 10 - x^3$  at the point where  $x = \alpha$ .
- (a)** Show that  $\alpha$  lies between 1 and 2. (2 marks)
- (b) (i)** Show that the equation  $3^x = 10 - x^3$  can be rearranged into the form  $x = \sqrt[3]{10 - 3^x}$ . (1 mark)
- (ii)** Use the iteration  $x_{n+1} = \sqrt[3]{10 - 3^{x_n}}$  with  $x_1 = 1$  to find the values of  $x_2$  and  $x_3$ , giving your answers to three decimal places. (2 marks)

QUESTION  
PART  
REFERENCE





**2 (a)** The diagram shows the graph of  $y = \sec x$  for  $0^\circ \leq x \leq 360^\circ$ .



(i) The point  $A$  on the curve is where  $x = 0$ . State the  $y$ -coordinate of  $A$ . (1 mark)

(ii) Sketch, on the axes given on page 5, the graph of  $y = |\sec 2x|$  for  $0^\circ \leq x \leq 360^\circ$ . (3 marks)

(b) Solve the equation  $\sec x = 2$ , giving all values of  $x$  in degrees in the interval  $0^\circ \leq x \leq 360^\circ$ . (2 marks)

(c) Solve the equation  $|\sec(2x - 10^\circ)| = 2$ , giving all values of  $x$  in degrees in the interval  $0^\circ \leq x \leq 180^\circ$ . (4 marks)

QUESTION  
PART  
REFERENCE

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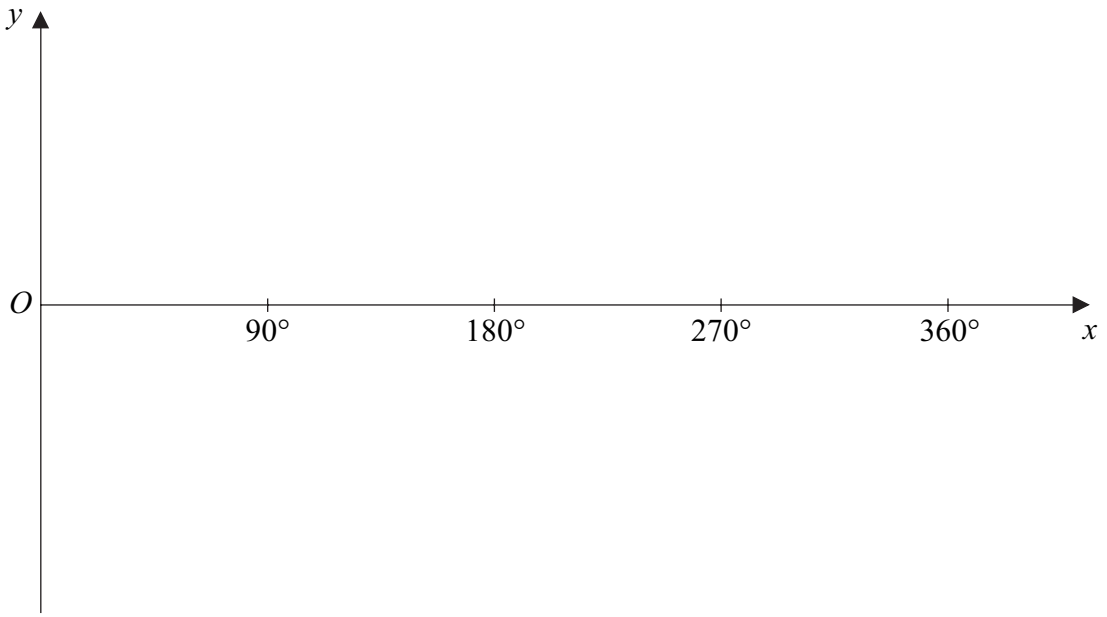
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QUESTION  
PART  
REFERENCE

(a)(ii)



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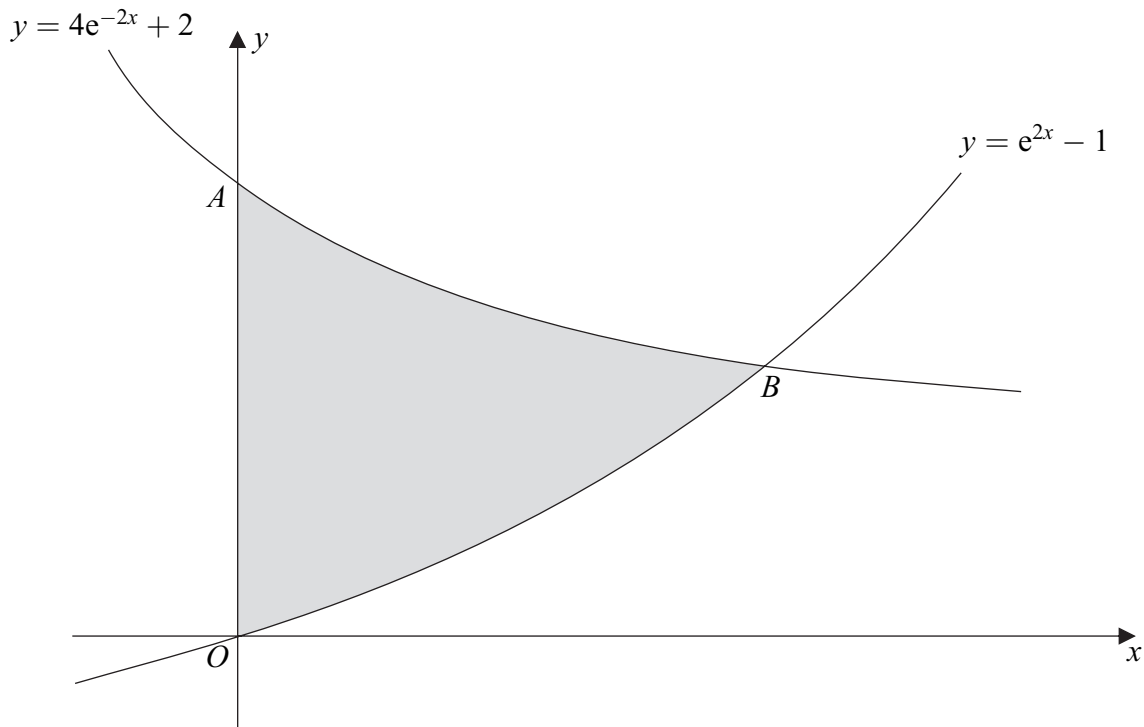








- 8 The diagram shows the curves  $y = e^{2x} - 1$  and  $y = 4e^{-2x} + 2$ .



The curve  $y = 4e^{-2x} + 2$  crosses the  $y$ -axis at the point  $A$  and the curves intersect at the point  $B$ .

- (a) Describe a sequence of two geometrical transformations that maps the graph of  $y = e^x$  onto the graph of  $y = e^{2x} - 1$ . (4 marks)
- (b) Write down the coordinates of the point  $A$ . (1 mark)
- (c) (i) Show that the  $x$ -coordinate of the point  $B$  satisfies the equation
- $$(e^{2x})^2 - 3e^{2x} - 4 = 0 \quad (2 \text{ marks})$$
- (ii) Hence find the exact value of the  $x$ -coordinate of the point  $B$ . (3 marks)
- (d) Find the exact value of the area of the shaded region bounded by the curves  $y = e^{2x} - 1$  and  $y = 4e^{-2x} + 2$  and the  $y$ -axis. (5 marks)

QUESTION  
PART  
REFERENCE











**There are no questions printed on this page**

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ANSWER IN THE SPACES PROVIDED**

