

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	
TOTAL	



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.

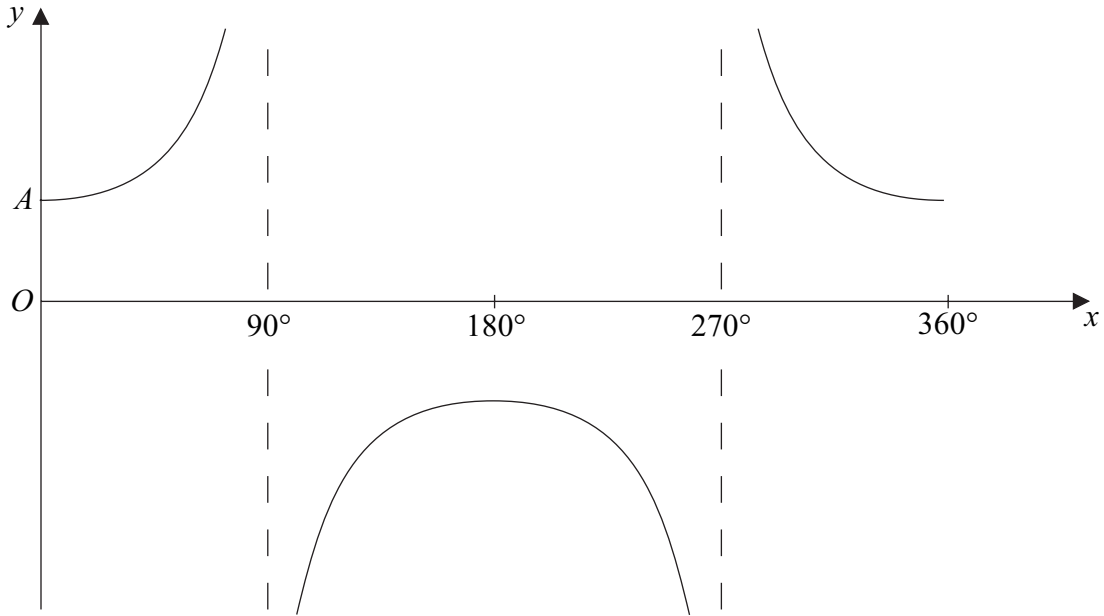


J U N 1 0 M P C 3 0 1





**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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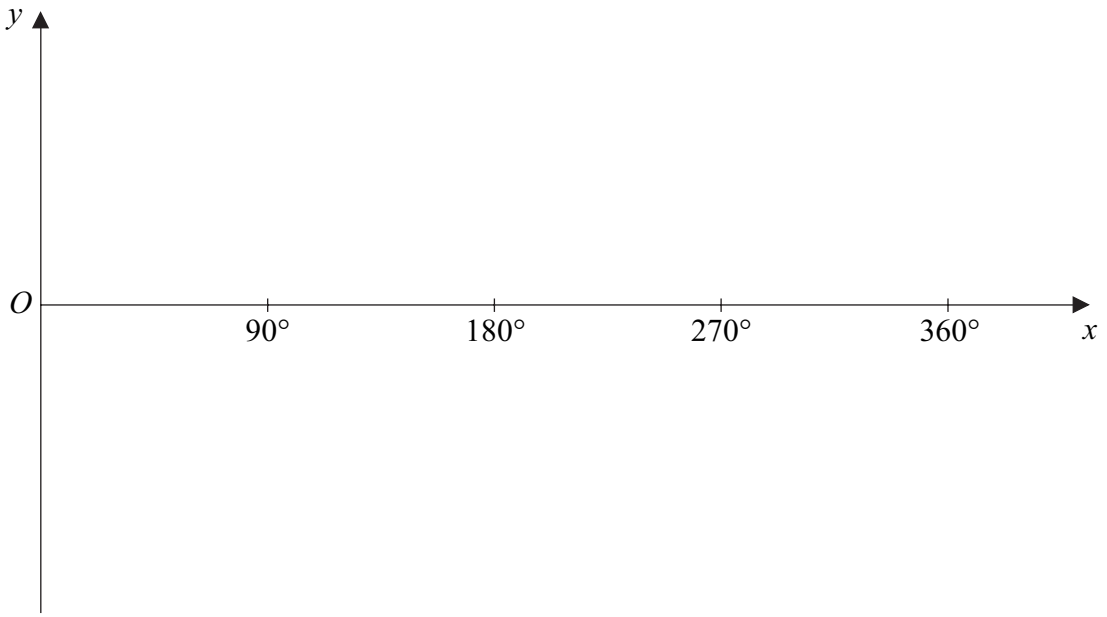
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QUESTION  
PART  
REFERENCE

(a)(ii)



A series of horizontal dotted lines for writing the answer.

Turn over ►



**3 (a)** Find  $\frac{dy}{dx}$  when:

**(i)**  $y = \ln(5x - 2)$ ; *(2 marks)*

**(ii)**  $y = \sin 2x$ . *(2 marks)*

**(b)** The functions  $f$  and  $g$  are defined with their respective domains by

$$f(x) = \ln(5x - 2), \quad \text{for real values of } x \text{ such that } x \geq \frac{1}{2}$$

$$g(x) = \sin 2x, \quad \text{for real values of } x \text{ in the interval } -\frac{\pi}{4} \leq x \leq \frac{\pi}{4}$$

**(i)** Find the range of  $f$ . *(2 marks)*

**(ii)** Find an expression for  $gf(x)$ . *(1 mark)*

**(iii)** Solve the equation  $gf(x) = 0$ . *(3 marks)*

**(iv)** The inverse of  $g$  is  $g^{-1}$ . Find  $g^{-1}(x)$ . *(2 marks)*

QUESTION  
PART  
REFERENCE













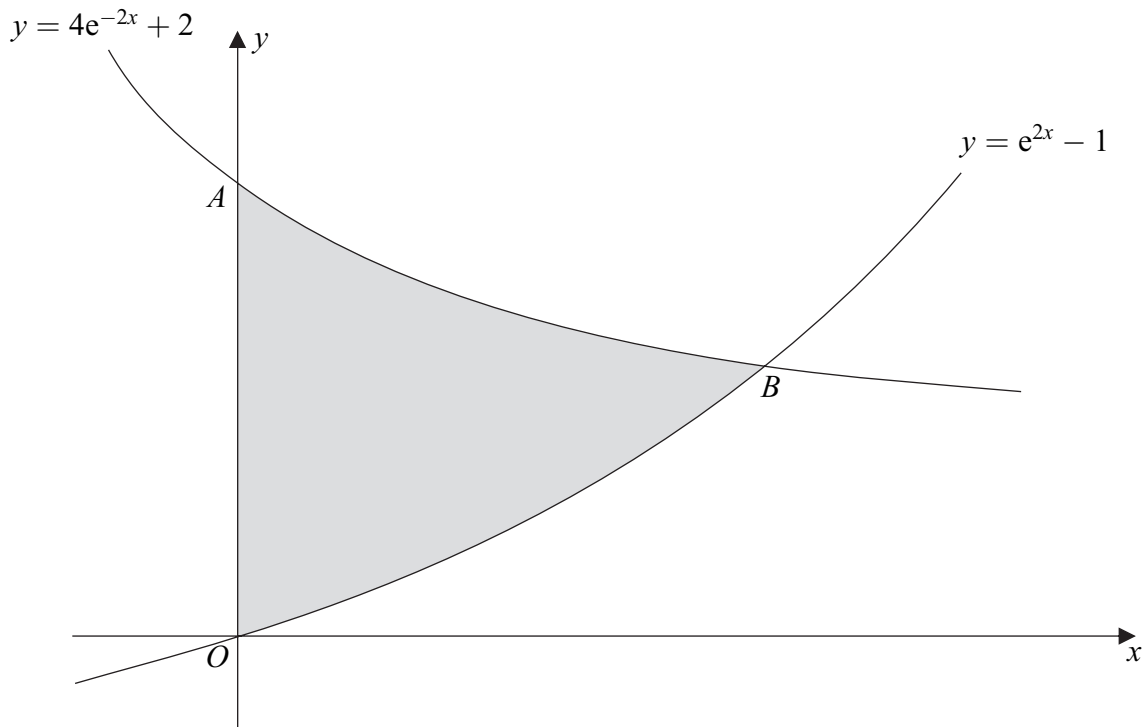








8 The diagram shows the curves  $y = e^{2x} - 1$  and  $y = 4e^{-2x} + 2$ .



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
 
$$(e^{2x})^2 - 3e^{2x} - 4 = 0$$
 (2 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

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

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ANSWER IN THE SPACES PROVIDED**

