

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 2014

## Mathematics

## MPC3

### Unit Pure Core 3

Tuesday 10 June 2014 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 each question in the space provided for that question. If you require extra space, use an AQA supplementary answer book; do **not** use the space provided for a different question.
- 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.
- You do not necessarily need to use all the space provided.



J U N 1 4 M P C 3 0 1

Answer **all** questions.

Answer each question in the space provided for that question.

**1** Use Simpson's rule, with five ordinates (four strips), to calculate an estimate for

$$\int_0^{\pi} x^{\frac{1}{2}} \sin x \, dx$$

Give your answer to four significant figures.

**[4 marks]**

QUESTION  
PART  
REFERENCE

**Answer space for question 1**









**3 (a) (i)** Differentiate  $(x^2 + 1)^{\frac{5}{2}}$  with respect to  $x$ .

**[2 marks]**

**(ii)** Given that  $y = e^{2x}(x^2 + 1)^{\frac{5}{2}}$ , find the value of  $\frac{dy}{dx}$  when  $x = 0$ .

**[3 marks]**

**(b)** A curve has equation  $y = \frac{4x - 3}{x^2 + 1}$ . Use the quotient rule to find the  $x$ -coordinates of the stationary points of the curve.

**[5 marks]**

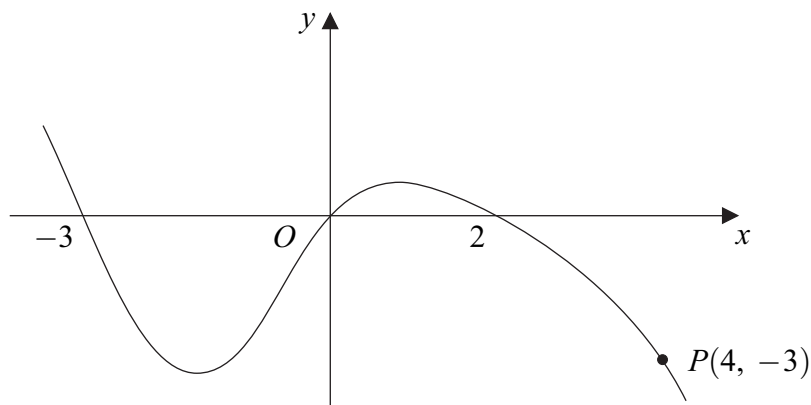
QUESTION  
PART  
REFERENCE

**Answer space for question 3**





- 4 The sketch shows part of the curve with equation  $y = f(x)$ .



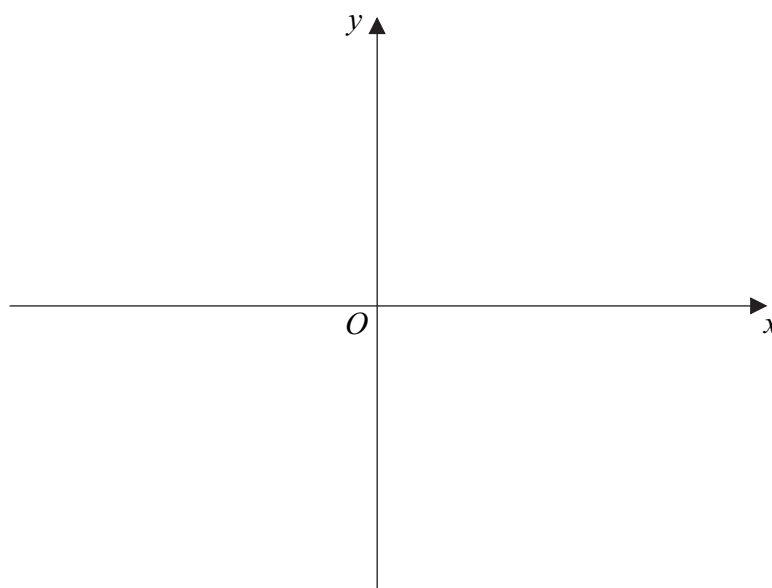
- (a) On **Figure 2** below, sketch the curve with equation  $y = -|f(x)|$ . **[3 marks]**
- (b) On **Figure 3** on the page opposite, sketch the curve with equation  $y = f(|2x|)$ . **[2 marks]**
- (c) (i) Describe a sequence of two geometrical transformations that maps the graph of  $y = f(x)$  onto the graph of  $y = f(2x + 2)$ . **[4 marks]**
- (ii) Find the coordinates of the image of the point  $P(4, -3)$  under the sequence of transformations given in part (c)(i). **[2 marks]**

QUESTION  
PART  
REFERENCE

**Answer space for question 4**

(a)

**Figure 2**



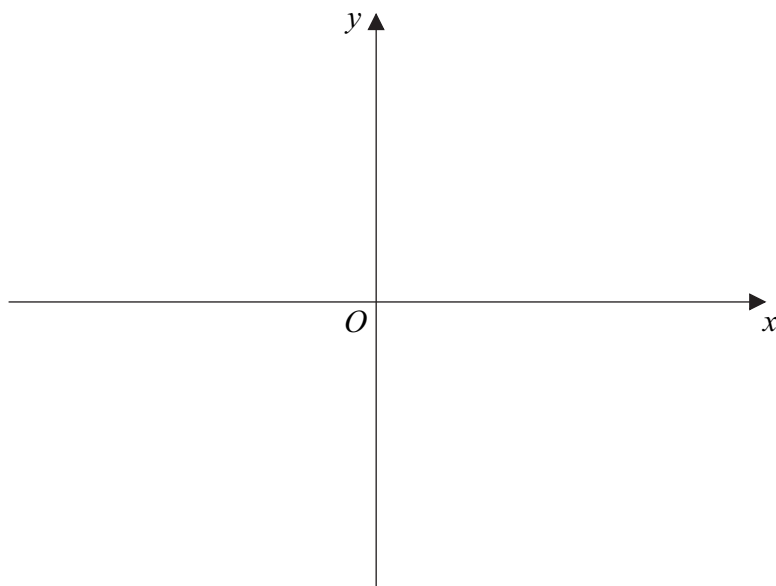


QUESTION  
PART  
REFERENCE

Answer space for question 4

(b)

Figure 3



Area with horizontal dotted lines for writing.

Turn over ►



**5** The functions  $f$  and  $g$  are defined with their respective domains by

$$f(x) = x^2 - 6x + 5, \quad \text{for } x \geq 3$$

$$g(x) = |x - 6|, \quad \text{for all real values of } x$$

**(a)** Find the range of  $f$ . **[2 marks]**

**(b)** The inverse of  $f$  is  $f^{-1}$ .  
Find  $f^{-1}(x)$ . Give your answer in its simplest form. **[4 marks]**

**(c) (i)** Find  $gf(x)$ . **[1 mark]**

**(ii)** Solve the equation  $gf(x) = 6$ . **[4 marks]**

QUESTION  
PART  
REFERENCE

**Answer space for question 5**





















QUESTION  
PART  
REFERENCE

**Answer space for question 8**

Area with horizontal dotted lines for writing the answer.

**END OF QUESTIONS**



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

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ANSWER IN THE SPACES PROVIDED**

