

Centre Number										Candidate Number								
Surname																		
Other Names																		
Candidate Signature																		

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



General Certificate of Education  
Advanced Subsidiary Examination  
June 2013

# Mathematics

# MPC1

## Unit Pure Core 1

Monday 13 May 2013 1.30 pm to 3.00 pm

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>the blue AQA booklet of formulae and statistical tables.</li> </ul> <p>You must <b>not</b> use a calculator.</p>	
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### 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.
- The use of calculators is **not** permitted.

### 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.



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QUESTION  
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REFERENCE

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QUESTION  
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**Answer space for question 2**

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QUESTION  
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QUESTION  
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**5 (a) (i)** Express  $2x^2 + 6x + 5$  in the form  $2(x + p)^2 + q$ , where  $p$  and  $q$  are rational numbers. (2 marks)

**(ii)** Hence write down the minimum value of  $2x^2 + 6x + 5$ . (1 mark)

**(b)** The point  $A$  has coordinates  $(-3, 5)$  and the point  $B$  has coordinates  $(x, 3x + 9)$ .

**(i)** Show that  $AB^2 = 5(2x^2 + 6x + 5)$ . (3 marks)

**(ii)** Use your result from part **(a)(ii)** to find the minimum value of the length  $AB$  as  $x$  varies, giving your answer in the form  $\frac{1}{2}\sqrt{n}$ , where  $n$  is an integer. (2 marks)

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**6** A curve has equation  $y = x^5 - 2x^2 + 9$ . The point  $P$  with coordinates  $(-1, 6)$  lies on the curve.

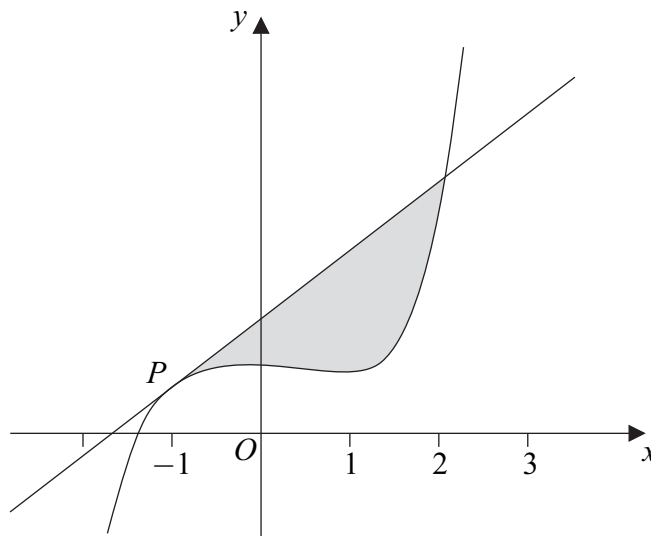
**(a)** Find the equation of the tangent to the curve at the point  $P$ , giving your answer in the form  $y = mx + c$ . (5 marks)

**(b)** The point  $Q$  with coordinates  $(2, k)$  lies on the curve.

**(i)** Find the value of  $k$ . (1 mark)

**(ii)** Verify that  $Q$  also lies on the tangent to the curve at the point  $P$ . (1 mark)

**(c)** The curve and the tangent to the curve at  $P$  are sketched below.



**(i)** Find  $\int_{-1}^2 (x^5 - 2x^2 + 9) dx$ . (5 marks)

**(ii)** Hence find the area of the shaded region bounded by the curve and the tangent to the curve at  $P$ . (3 marks)

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QUESTION  
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QUESTION  
PART  
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**Answer space for question 6**

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**7** The quadratic equation

$$(2k - 7)x^2 - (k - 2)x + (k - 3) = 0$$

has real roots.

- (a) Show that  $7k^2 - 48k + 80 \leq 0$ . (4 marks)
- (b) Find the possible values of  $k$ . (4 marks)

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QUESTION  
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**Answer space for question 7**

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**END OF QUESTIONS**

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