

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 2012

Mathematics

MFP2

Unit Further Pure 2

Thursday 31 May 2012 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 2 M F P 2 0 1

Answer **all** questions.

Answer each question in the space provided for that question.

1 (a) Sketch the curve $y = \cosh x$. *(1 mark)*

(b) Solve the equation

$$6 \cosh^2 x - 7 \cosh x - 5 = 0$$

giving your answers in logarithmic form. *(6 marks)*

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2 (a) Draw on the Argand diagram below:

(i) the locus of points for which

$$|z - 2 - 3i| = 2 \quad (3 \text{ marks})$$

(ii) the locus of points for which

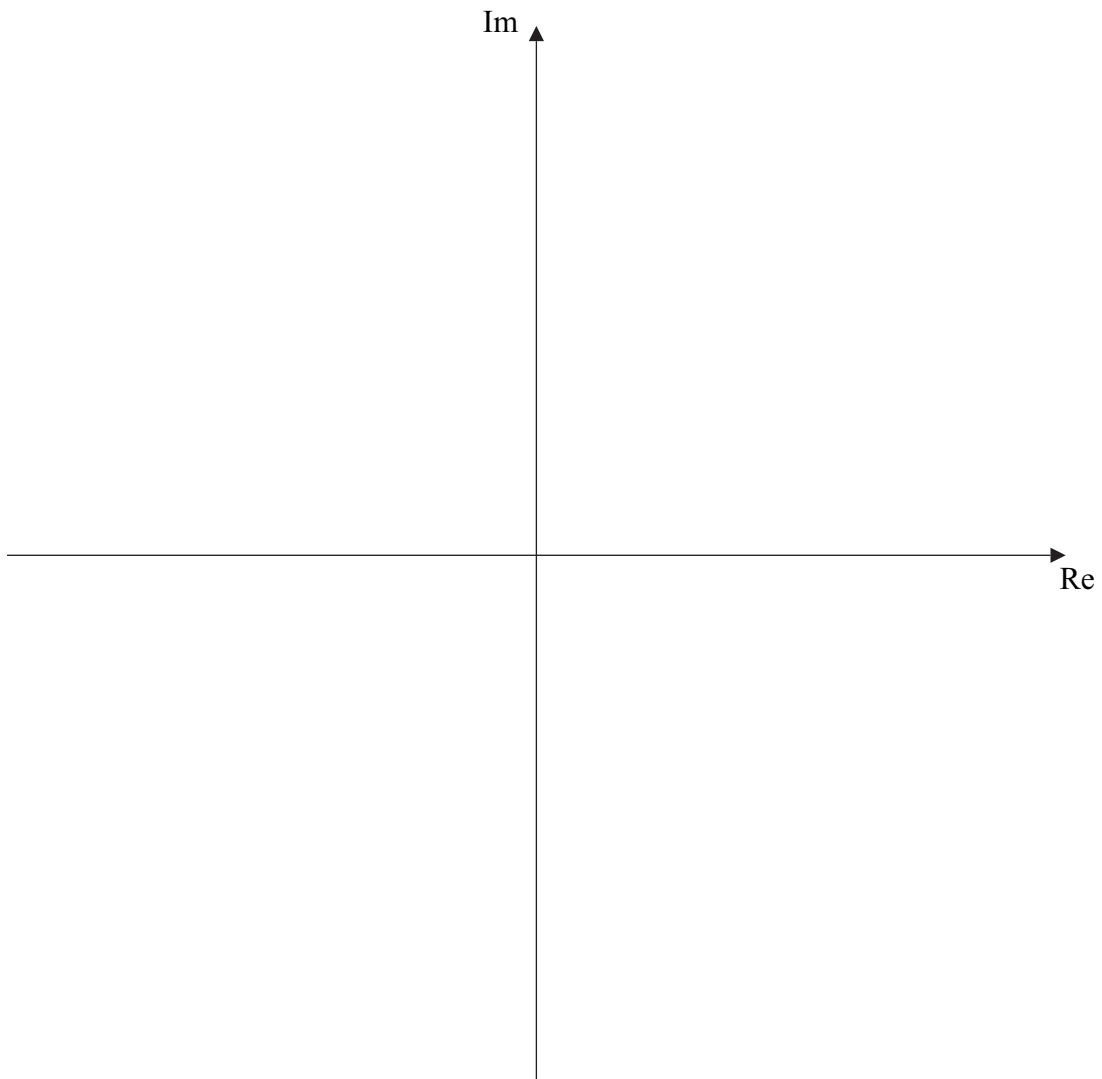
$$|z + 2 - i| = |z - 2| \quad (3 \text{ marks})$$

(b) Indicate on your diagram the points satisfying both

$$|z - 2 - 3i| = 2$$

and

$$|z + 2 - i| \leq |z - 2| \quad (1 \text{ mark})$$



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4 The cubic equation

$$z^3 + pz + q = 0$$

has roots α , β and γ .

(a) (i) Write down the value of $\alpha + \beta + \gamma$. (1 mark)

(ii) Express $\alpha\beta\gamma$ in terms of q . (1 mark)

(b) Show that

$$\alpha^3 + \beta^3 + \gamma^3 = 3\alpha\beta\gamma \quad (3 \text{ marks})$$

(c) Given that $\alpha = 4 + 7i$ and that p and q are real, find the values of:

(i) β and γ ; (2 marks)

(ii) p and q . (3 marks)

(d) Find a cubic equation with integer coefficients which has roots $\frac{1}{\alpha}$, $\frac{1}{\beta}$ and $\frac{1}{\gamma}$. (3 marks)

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ANSWER IN THE SPACES PROVIDED**

