

Assignment 1

Differential Calculus Summer School 2012

Due Monday 16th January

1. Consider the following two regions in the complex plane:

$$A = \{z \in \mathbb{C} : |z - 3 - 2i| \leq 2\} \text{ and}$$

$$B = \{z \in \mathbb{C} : \operatorname{Im}(z) \leq 2 \operatorname{Re}(z) - 4\}.$$

Make a sketch of A and B on the same complex plane and indicate the region $A \cap B$ by shading it. Make sure you clearly label your axes.

2. Solve the following quadratic equation $z^2 - (6 + i)z + 8 + 4i = 0$ given that one of its two roots is real.

(*Hint: There is no need to use the quadratic formula; if α and β are the roots of the quadratic, then we have $z^2 - (\alpha + \beta)z + \alpha\beta = 0$.)*)

3. Find all complex roots of

$$p(z) = z^4 - 10z^3 + 38z^2 - 74z + 85$$

given that $4 + i$ is a root.

(*Hint: Recall that roots of polynomials with real coefficients occur in complex conjugate pairs.*)

Assignment Cover Sheet

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Family Name

Given Names SID

Some collaboration between students on assignments is encouraged, since it can be a real aid to understanding. Thus it is legitimate for students to discuss assignment questions at a general level, provided everybody involved makes some contribution. However, students should produce their own individual written solution. Copying someone else's work is plagiarism, and is unacceptable. The University may impose severe penalties in cases where plagiarism is detected.

I certify that:

- I have read and understood the *University of Sydney Student Plagiarism: Course-work Policy and Procedure* at
- this assignment is all my own work, and that no part of this assignment has been copied from another person.
- I have not allowed my work to be copied by another person.

Signature Date

This part to be completed by the marker:

Question 1 out of 5

Question 2 out of 5

Question 3 out of 5

Grand total out of 15 Marker's initial