

## Assignment 1



MATH1021: Calculus of one variable

Semester 1, 2023

Lecturer: Haotian Wu

This **individual** assignment is due by **11:59pm Thursday 16 March 2023**, via Canvas. Late assignments will receive a penalty of 5% per day until the closing date. A single PDF copy of your answers must be uploaded in Canvas at <https://canvas.sydney.edu.au/courses/48840>. It should include your SID. Please make sure you review your submission carefully. What you see is exactly how the marker will see your assignment. Submissions can be overwritten until the due date. To ensure compliance with our anonymous marking obligations, please do not under any circumstances include your name in any area of your assignment; only your SID should be present. The School of Mathematics and Statistics encourages some collaboration between students when working on problems, but students must write up and submit their own version of the solutions. If you have technical difficulties with your submission, see the University of Sydney Canvas Guide, available from the Help section of Canvas.

This assignment is worth 5% of your final assessment for this course. Your answers should be well written, neat, thoughtful, mathematically concise, and a pleasure to read. Please cite any resources used and show all working. Present your arguments clearly using words of explanation and diagrams where relevant. After all, mathematics is about communicating your ideas. This is a worthwhile skill which takes time and effort to master. The marker will give you feedback and allocate an overall mark to your assignment using the following criteria:

Rubric							 
Criteria	Ratings						Pts
Correct solutions to the questions	<b>4 pts</b> <b>Excellent</b> Excellent work, answering all parts correctly. There are at most only minor or trivial errors or omissions.	<b>3 pts</b> <b>Very good work</b> Making very good progress but with one or two substantial errors, misunderstandings or omissions throughout the assignment.	<b>2 pts</b> <b>Good work</b> Making good progress, but making more than two distinct substantial errors, misunderstandings or omissions throughout the assignment.	<b>1 pts</b> <b>Fair work</b> A reasonable attempt, but making more than three distinct substantial errors, misunderstandings or omissions throughout the assignment.	<b>0 pts</b> <b>No Marks</b> No credit awarded.	4 pts	
Clear explanations, diagrams and working shown	<b>1 pts</b> <b>Full Marks</b> Criteria met.		<b>0 pts</b> <b>No Marks</b> No clear explanations.			1 pts	
Total Points: 5							

1. Let  $A = \{1, 2, 3, 4, 5, 6, 7\}$ ,  $B = \{1, 3, 5, 8, 9\}$ ,  $C = \{1, 4, 6, 8\}$  and  $D = \{3, 5, 7, 8\}$ .
  - (a) Find  $(A \cap B) \setminus C$ .
  - (b) Find  $(A \setminus D) \cup (D \setminus A)$  and  $(A \cup D) \setminus (A \cap D)$ .

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2. Express the following complex numbers in Cartesian form  $z = a + ib$ .
  - (a)  $z = (1 + i)(-2 + 3i)$ .
  - (b)  $z = \left(\frac{1+i}{1-i}\right)^{2023}$ .

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3. Let  $z = -3 + 3\sqrt{3}i$ .
  - (a) Express  $z$  in standard polar form.
  - (b) Express  $z$  in polar exponential form.

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4. Find all fifth roots of the complex number  $-2$ , and plot and label them on the complex plane by hand<sup>1</sup>.

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5. Find all  $z \in \mathbb{C}$  satisfying the given equation or inequality:

(a)  $5z^2 - 6z + 5 = 0$

(b)  $|z - 5| + |z + 1| \leq |z - 2|$

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<sup>1</sup>You are not allowed to submit plots generated by software as your own work.