

National University of Singapore
Department of Mathematics

MA2108 Mathematical Analysis I

Homework 1

Instruction

1. Do all the problems and submit on Sep. 5 (Monday) before 11:59pm.
2. Show your steps of your working how the answers are derived, unless the questions state otherwise.
3. Late Submission will not be accepted. The submission folder will be automatically closed after the deadline of the homework.
4. **Warning:** You could discuss with your friends on the homework. But if you are found to have copied answers from your friend(s) directly, both you and your friend(s) will be penalized.
5. All questions will be graded.
6. Here are the **instructions** on how to submit your homework:
 - (a) Use A4 size writing paper and indicate the question numbers clearly in each paper (you do not need to copy the questions in your answer sheets).
 - (b) Scan or take pictures of your work (it is your responsibility to make sure the images can be read clearly);
 - (c) Merge all your images into **one pdf file** (arrange them in the order: Q1(a), Q1(b), Q2, Q3 in their page sequence);
 - (d) Name the pdf file by Matric No. Code (e.g. A123456R);
 - (e) Upload your pdf into the Canvas Assignments “Homework1”.

You may use some scanning app (see below) to carry out the above procedures.

- Scanning app for Android: <https://fossbytes.com/best-android-scanner-apps/>
- Scanning app for iPhone: <https://www.switchingtomac.com/tutorials/ios-tutorials/the-best-ios-scanner-apps-to-scan-documents-images/>

Problem Set

1. (a) Find all values of x such that satisfy the following inequality:

$$x < \frac{1}{4x}.$$

- (b) Find the infimum and the supremum of the set $\{x \in \mathbb{R} : x < \frac{1}{4x}\}$ if they exist.

2. Let A and B be nonempty bounded subsets of \mathbb{R} . Define the set

$$C := \{a + b : a \in A, b \in B\}.$$

Show that $\sup C = \sup A + \sup B$.

3. Show that there exists a unique positive real number x such that $x^2 = 3$. Remark that this is a similar question to Theorem 2.4.7. Please show the details of the proof instead of citing the remark about the uniqueness of the positive n -th roots to prove this statement.