MH3100 Real Analysis I

Midterm Practice 3 (Questions)

AY 2026/2027, Semester 1 – QRS original

Quantitative Research Society @NTU

October 12, 2026

TIME ALLOWED: 60 minutes

Instructions to Students

1. This test contains **FOUR (4)** questions.
2. Answer **all** questions. The marks for each question are indicated below.
3. Write your answers in the space provided. If you need more space, continue on the facing page and clearly indicate that you have done so.
4. This is a **CLOSED BOOK** test.
5. You may use calculators. You may cite any results proved in the lectures and tutorials, **unless you are asked by the question to prove the result.**

Question	1	2	3	4	Total
Total Marks	6	6	6	6	24
Awarded Marks					

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Question 1 (6 Marks)

Is each of the following statement true or false? You do NOT need to justify your answer.

(a) (2 marks) If A and B are nonempty subsets of $\mathbb{R}$ with $A \subseteq B$ and B bounded above, then $\sup A \leq \sup B$.

(b) (2 marks) The set $A = \{q \in \mathbb{Q} : q > 0 \text{ and } q^2 < 2\}$ has a supremum in $\mathbb{Q}$.

(c) (2 marks) Every bounded monotone sequence of rational numbers converges to a rational number.

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Question 2 (6 Marks)

Is each of the following statement true or false? You do NOT need to justify your answer.

(a) (2 marks) Every infinite and bounded subset of $\mathbb{R}$ has a limit point.

(b) (2 marks) The closure of a bounded subset of $\mathbb{R}$ is (sequentially) compact.

(c) (2 marks) Every set with no limit points is (sequentially) compact.

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Question 3 (6 Marks)

In this question, A and B are sets of real numbers. **Write down the definition** of a limit point of a set, and **use the definition to show** that if x is a limit point of $A \cup B$, then x is a limit point of A or x is a limit point of B. *Do not use the Sequential Criterion for Limit Points.*

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Continue your answer to Question 3 here:

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Question 4 (6 Marks)

Write down the definition of a (sequentially) compact set, and **use the definition to show** that if K_1 and K_2 are compact sets, then $K_1 \cup K_2$ is compact. *Do not use the Sequential Compactness of Closed and Bounded Sets or the Bolzano-Weierstrass Theorem.*

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Continue your answer to Question 4 here:

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Answer to Question continues here: (Use this page if you need more space.)

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