

You're invited

TO

QUIZ 2 OF 35007 REAL ANALYSIS

WHEN? 3:10pm to 4:10pm, Wednesday 16th September 2026.

WHERE? Room 320, Level 3, Building 4.

Details ...



EXAMINABLE MATERIAL

The examinable material for Quiz 2 is:

- Series.
- Limits for functions.
- Continuous functions.
- Uniform and Lipschitz continuity.
- Derivatives theory.

The relevant parts of main notes are:

Section 1.5	Section 2.1	Section 2.2
Section 2.3	Section 3.1	

PERMITTED AND FORBIDDEN ITEMS

The permitted and forbidden items for Quiz 2 is conveyed by the following rules that will appear on the first page of the quiz document:

Items allowed:
Pens One A4 sheet of paper with summaries of relevant material from the notes. Both sides of the sheet can contain material.

Items not allowed:
Please leave all items with electronics such as calculators, mobile phones, electronic watches, ear phones and AI glasses, switched off and stored in accompanying baggage.

PRACTICE EXERCISES

Out of Exercise Sets A–L, the following have possible relevance to Quiz 2.

- Exercise Set D.
- Exercise Set E.
- Exercise Set F.
- Exercises G.1. to G.8.

It follows that these exercises sets are recommended as good practice ones for Quiz 2.

A PDF file containing solutions to the practice exercises will be made available on matt-p-wand.net/35007.html at 4:00pm Tuesday 8th September.

UNIVERSITY OF TECHNOLOGY SYDNEY
School of Mathematical and Physical Sciences
35007 Real Analysis

Practice Quiz 2

Time allowed: 1 hour

Items allowed:
Pens One A4 sheet of paper with summaries of relevant material from the notes. Both sides of the sheet can contain material.

Items not allowed:
Please leave all items with electronics such as calculators, mobile phones, electronic watches, ear phones and AI glasses, switched off and stored in accompanying baggage.

Instructions ¹

1. The quiz questions are overleaf. Please wait until instructed to overturn this sheet and start reading them.
2. Write your solutions in the examination booklet. Please make sure that your name and student number is written on the first page of the booklet.
3. Unless stated otherwise, all working must be shown and partial credit will be awarded for correct steps in your working.
4. Additional background working that is not part of your solutions should be clearly marked as being separate from your solutions.
5. You may leave before the end of the permitted time. Please do so quietly and place your examination booklet in the box at the front of the room.

¹These instructions and the above restrictions don't apply to the practice quiz (unless you want them to) and are given here to show you how the actual quiz will be.

1. Using one or more theorems from the subject material determine whether or not the following series converges:

$$\sum_{n=1}^{\infty} \left(\frac{\sqrt{n^2 + 17} - \sqrt{n^2 + 12}}{8n + 3} \right).$$

The fact that $\sum_{n=1}^{\infty} \frac{1}{n^{\alpha}}$ diverges for $\alpha \leq 1$ and converges for $\alpha > 1$ may be assumed.

2. Using only the definition, prove that $f : [0, 2] \rightarrow \mathbb{R}$ given by

$$f(x) = 4x^3$$

is uniformly continuous on $[0, 2]$. The algebraic identity $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ may be assumed.

3. Suppose that $f : \mathbb{R} \rightarrow \mathbb{R}$ given by

$$f(x) = |x|^3, \quad x \in \mathbb{R}.$$

Prove that f is differentiable at $x = 0$ and determine the value of $f'(0)$.

4. (a) Prove that for all $x \in \mathbb{R}$

$$\left| \frac{1}{x^2 + 11} - \frac{1}{27} \right| = \frac{|x - 4||x + 4|}{27(x^2 + 11)}.$$

- (b) Using the ε - δ definition of a limit for a function on $X \subseteq \mathbb{R}$ and with

$$\delta = \min(1, 60\varepsilon) \quad \text{for each given value of } \varepsilon > 0$$

prove that

$$\lim_{x \rightarrow 4} \frac{1}{x^2 + 11} = \frac{1}{27}.$$

The fact that 4 is a limit point of $\mathbb{R}$ may be assumed.

END OF QUIZ

A PDF file containing solutions to Practice Quiz 2 will be made available on matt-p-wand.net/35007.html at 4:00pm Tuesday 8th September.