



# MATH2210

## Pure Mathematics II

Session 2, In person-scheduled-weekday, North Ryde 2022

*School of Mathematical and Physical Sciences*

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## General Information

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Credit points

10

Prerequisites

MATH2010 or MATH235

Corequisites

Co-badged status

Unit description

This unit will introduce students to the abstract approach to mathematics, which offers great benefits in terms of simplicity, rigour, and generality. The key components of this are the careful definition of the objects of interest, the development of intuition allowing consequences of these definitions to be found, and the rigorous proof of these consequences. As such, it represents an important stepping stone towards many later mathematics units, as well as being valuable in its own right. This introduction will be taught in the context of different areas of mathematics, including: analysis, which concerns limits and convergence in many contexts; algebra, which concerns the nature and properties of mathematical operations; and discrete mathematics, which involves topics such as logic and counting.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

**ULO1:** Demonstrate an understanding of the abstract approach to mathematics, including its benefits with regards to simplicity, rigour, and generality.

**ULO2:** Construct formal proofs of simple statements in the subject areas of the unit.

**ULO3:** Formulate problems in mathematical terms using a variety of methods from analysis, algebra, and discrete mathematics.

**ULO4:** Demonstrate an understanding of the breadth of the discipline, its role in other fields, and the way other fields contribute to the development of the mathematical sciences.

**ULO5:** Appropriately interpret information communicated in mathematical form.

**ULO6:** Appropriately present information, reasoning and conclusions in a variety of modes to diverse audiences (expert and non-expert).

**ULO7:** Demonstrate an understanding of ethical issues relating to professional mathematical work, identify and address ethical issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.

**ULO8:** Work effectively, responsibly and safely in an individual or team context.

## General Assessment Information

**HURDLES:** Collaboration in the SGTAs is a hurdle requirement. You must attend and participate in at least 10 of the 12 SGTAs. (Of course you should actually do so for all of them.)

**ONLINE SUBMISSION:** Submission of assignments and the report will be online through the appropriate link on the MATH2210 iLearn page.

A personalized cover sheet is not required with online submissions. Read the submission statement carefully before accepting it as there are substantial penalties for making a false declaration.

You should upload your work as a single scanned PDF file.

Please make sure that each page in your uploaded assignment or report corresponds to only one A4 page (do not upload an A3 page worth of content as an A4 page in landscape). If you are using an app like Clear Scanner, please make sure that the photos you are using are clear and shadow-free.

It is your responsibility to make sure your assignment submission is legible.

If there are technical obstructions to your submitting online, please email us to let us know.

You may submit as often as required prior to the due date/time. Please note that each submission will completely replace any previous submissions. It is in your interests to make frequent submissions of your partially completed work as insurance against technical or other problems near the submission deadline.

It is recommended that students use the following computer software to prepare the report:

- **LaTeX:** LaTeX is a free mathematical typesetting program. Access and installation instructions may be found at: <https://www.latex-project.org/get/>
  - Students may also use the free online LaTeX compiler, Overleaf, which is found at: <https://www.overleaf.com>

**LATE SUBMISSION OF WORK:** From 1 July 2022, Students enrolled in Session based units with written assessments will have the following late penalty applied. Please see <https://students.mq.edu.au/study/assessment-exams/assessments> for more information.

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at 11:55 pm. A 1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for Special Consideration.

In this unit, late submissions will be accepted as follows:

- Assignments - YES, Standard Late Penalty applies
- Project - YES, Standard Late Penalty applies
- Collaboration in SGTAs - NO, unless Special Consideration is Granted
- Final Exam - NO, unless Special Consideration is Granted

**FINAL EXAM POLICY:** All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period. The only excuse for not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these special circumstances, you may apply for special consideration via [ask.mq.edu.au](https://ask.mq.edu.au).

#### **SUPPLEMENTARY EXAMINATIONS:**

**IMPORTANT:** If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. If you apply for special consideration, you must give the supplementary examination priority over any other pre-existing commitments, as such commitments will not usually be considered an acceptable basis for a second application for special consideration. Please ensure you are familiar with the policy prior to submitting an application. You can check the supplementary exam information page on FSE101 in iLearn (<https://bit.ly/FSESup>) for dates, and approved applicants will receive an individual notification sometime in the week prior to the exam with the exact date and time of their supplementary examination.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Assignment 1</a>	20%	No	Week 6
<a href="#">Assignment 2</a>	20%	No	Week 12
<a href="#">Collaboration in SGTAs</a>	0%	Yes	Weeks 2-13
<a href="#">Report</a>	20%	No	Week 13
<a href="#">Final Exam</a>	40%	No	Final Exam period

### Assignment 1

Assessment Type <sup>1</sup>: Problem set

Indicative Time on Task <sup>2</sup>: 5 hours

Due: **Week 6**

Weighting: **20%**

Set of questions with short answers involving proofs, calculations, and written responses.

On successful completion you will be able to:

- Demonstrate an understanding of the abstract approach to mathematics, including its benefits with regards to simplicity, rigour, and generality.
- Construct formal proofs of simple statements in the subject areas of the unit.
- Formulate problems in mathematical terms using a variety of methods from analysis, algebra, and discrete mathematics.
- Demonstrate an understanding of the breadth of the discipline, its role in other fields, and the way other fields contribute to the development of the mathematical sciences.
- Appropriately interpret information communicated in mathematical form.
- Appropriately present information, reasoning and conclusions in a variety of modes to diverse audiences (expert and non-expert).

### Assignment 2

Assessment Type <sup>1</sup>: Problem set

Indicative Time on Task <sup>2</sup>: 5 hours

Due: **Week 12**

Weighting: **20%**

Set of questions with short answers involving proofs, calculations, and written responses.

On successful completion you will be able to:

- Demonstrate an understanding of the abstract approach to mathematics, including its benefits with regards to simplicity, rigour, and generality.
- Construct formal proofs of simple statements in the subject areas of the unit.
- Formulate problems in mathematical terms using a variety of methods from analysis, algebra, and discrete mathematics.
- Demonstrate an understanding of the breadth of the discipline, its role in other fields, and the way other fields contribute to the development of the mathematical sciences.
- Appropriately interpret information communicated in mathematical form.
- Appropriately present information, reasoning and conclusions in a variety of modes to diverse audiences (expert and non-expert).

## Collaboration in SGTAs

Assessment Type <sup>1</sup>: Participatory task

Indicative Time on Task <sup>2</sup>: 0 hours

Due: **Weeks 2-13**

Weighting: **0%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

Students will be required to work in the SGTAs in a collaborative, professional, and ethical manner.

On successful completion you will be able to:

- Appropriately present information, reasoning and conclusions in a variety of modes to diverse audiences (expert and non-expert).
- Demonstrate an understanding of ethical issues relating to professional mathematical work, identify and address ethical issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in an individual or team context.

## Report

Assessment Type <sup>1</sup>: Report

Indicative Time on Task <sup>2</sup>: 10 hours

Due: **Week 13**

Weighting: **20%**

Report building on one of the topics covered in lectures.

On successful completion you will be able to:

- Demonstrate an understanding of the abstract approach to mathematics, including its benefits with regards to simplicity, rigour, and generality.
- Construct formal proofs of simple statements in the subject areas of the unit.
- Formulate problems in mathematical terms using a variety of methods from analysis, algebra, and discrete mathematics.
- Demonstrate an understanding of the breadth of the discipline, its role in other fields, and the way other fields contribute to the development of the mathematical sciences.
- Appropriately interpret information communicated in mathematical form.
- Appropriately present information, reasoning and conclusions in a variety of modes to diverse audiences (expert and non-expert).

## Final Exam

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 13 hours

Due: **Final Exam period**

Weighting: **40%**

This will be a summative examination conducted during the final examination period.

On successful completion you will be able to:

- Demonstrate an understanding of the abstract approach to mathematics, including its benefits with regards to simplicity, rigour, and generality.
- Construct formal proofs of simple statements in the subject areas of the unit.
- Formulate problems in mathematical terms using a variety of methods from analysis, algebra, and discrete mathematics.

- Demonstrate an understanding of the breadth of the discipline, its role in other fields, and the way other fields contribute to the development of the mathematical sciences.
- Appropriately interpret information communicated in mathematical form.

<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

There will be 2 hours of lectures each week, and a 2-hour SGTA, starting from week 2.

There is no official textbook for this unit. Detailed notes will be provided, supplemented by links to online material where appropriate.

## Unit Schedule

Week	Topic
1	Sets and counting
2	Relations
3	Natural numbers
4	Integers and rational numbers
5	Real numbers
6	Complex numbers
7	Continuity
8	Compactness
9	Banach spaces
10	Differentiability
11	Fixed point theorems
12	Inverse and implicit function theorems
13	Revision



## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## The Writing Centre

The [Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)

## Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.