



MATH3909

Real and Functional Analysis

Session 2, Special circumstances 2021

Archive (Pre-2022) - Department of Mathematics and Statistics

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Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

Session 2 Learning and Teaching Update

The decision has been made to conduct study online for the remainder of Session 2 for all units WITHOUT mandatory on-campus learning activities. Exams for Session 2 will also be online where possible to do so.

This is due to the extension of the lockdown orders and to provide certainty around arrangements for the remainder of Session 2. We hope to return to campus beyond Session 2 as soon as it is safe and appropriate to do so.

Some classes/teaching activities cannot be moved online and must be taught on campus. You should already know if you are in one of these classes/teaching activities and your unit convenor will provide you with more information via iLearn. If you want to confirm, see the list of [units with mandatory on-campus classes/teaching activities](#).

Visit the [MQ COVID-19 information page](#) for more detail.

General Information

Unit convenor and teaching staff

Unit Convenor/Lecturer

Ji Li

ji.li@mq.edu.au

Contact via Email

Room 710 in 12 WW

Monday 12:00-1:00

Lecturer

Paul Bryan

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Contact via Email

12WW 535

Please refer to iLearn

Paul Bryan

paul.bryan@mq.edu.au

Credit points

10

Prerequisites

((MATH2010 or MATH235) and (MATH2020 or MATH236)) or MATH3901 or MATH3902 or MATH3905 or MATH3906 or MATH331 or MATH332 or MATH335 or MATH336

Corequisites

Co-badged status

Unit description

This unit is concerned with a review of the limiting processes of real analysis and an introduction to functional analysis. Through the discussion of such abstract notions as metric spaces, normed vector spaces and inner product spaces, we can appreciate an elegant and powerful combination of ideas from analysis and linear algebra.

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 a well- developed knowledge of the principles, concepts and techniques of a broad range of areas in analysis and applied mathematics, with significant depth in analysis and functional analysis.

ULO2: demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other related fields of study.

ULO3: construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.

ULO4: formulate and model practical and abstract problems in mathematical terms using a variety of methods drawn from analysis and functional analysis.

ULO5: apply mathematical principles, concepts, techniques and technology efficiently to solve practical and abstract problems across a range of areas in analysis and functional analysis.

ULO6: interpret mathematical information communicated in wide range of forms.

General Assessment Information

HURDLES: This unit has no hurdle requirements.

ASSIGNMENT SUBMISSION: Assignment submission will be online through the iLearn page.

Submit assignments online via the appropriate assignment link on the iLearn page. A personalised 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.

- Assignment submission is via iLearn. You should upload this as a single scanned PDF file.
- Please note the quick guide on how to upload your assignments provided on the iLearn page.
- Please make sure that each page in your uploaded assignment 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.

LATE SUBMISSION OF WORK: All assignments or assessments must be submitted by the official due date and time. No marks will be given to late work unless an extension has been granted following a successful application for [Special Consideration](#). Please contact the unit convenor for advice as soon as you become aware that you may have difficulty meeting any of the assignment deadlines. It is in your interests to make frequent submissions of your partially completed work. Note that later submissions completely replace any earlier submission, and so only the final submission made before the due date will be marked.

FINAL EXAM POLICY: Examinations for individuals or groups of students. 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.

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/FSESupp>) 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
Assignment 1	15%	No	Week 7
iLearn Test	20%	No	Week 10
Assignment 2	15%	No	Week 12
Final Exam	50%	No	Exam period

Assignment 1

Assessment Type ¹: Problem set

Indicative Time on Task ²: 10 hours

Due: **Week 7**

Weighting: **15%**

The assignment will include a set of questions with short answers involving proofs and calculations.

On successful completion you will be able to:

- demonstrate a well- developed knowledge of the principles, concepts and techniques of a broad range of areas in analysis and applied mathematics, with significant depth in analysis and functional analysis.
- demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other related fields of study.
- construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
- formulate and model practical and abstract problems in mathematical terms using a variety of methods drawn from analysis and functional analysis.
- apply mathematical principles, concepts, techniques and technology efficiently to solve practical and abstract problems across a range of areas in analysis and functional analysis.
- interpret mathematical information communicated in wide range of forms.

iLearn Test

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 10 hours

Due: **Week 10**

Weighting: **20%**

The test will cover both the real and functional analysis components of the unit.

On successful completion you will be able to:

- demonstrate a well- developed knowledge of the principles, concepts and techniques of a broad range of areas in analysis and applied mathematics, with significant depth in analysis and functional analysis.
- demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other related fields of study.

- construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
- formulate and model practical and abstract problems in mathematical terms using a variety of methods drawn from analysis and functional analysis.
- apply mathematical principles, concepts, techniques and technology efficiently to solve practical and abstract problems across a range of areas in analysis and functional analysis.
- interpret mathematical information communicated in wide range of forms.

Assignment 2

Assessment Type ¹: Problem set

Indicative Time on Task ²: 10 hours

Due: **Week 12**

Weighting: **15%**

The assignment will include a set of questions with short answers involving proofs and calculations.

On successful completion you will be able to:

- demonstrate a well- developed knowledge of the principles, concepts and techniques of a broad range of areas in analysis and applied mathematics, with significant depth in analysis and functional analysis.
- demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other related fields of study.
- construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
- formulate and model practical and abstract problems in mathematical terms using a variety of methods drawn from analysis and functional analysis.
- apply mathematical principles, concepts, techniques and technology efficiently to solve practical and abstract problems across a range of areas in analysis and functional analysis.
- interpret mathematical information communicated in wide range of forms.

Final Exam

Assessment Type ¹: Examination

Indicative Time on Task ²: 15 hours

Due: **Exam period**

Weighting: **50%**

The final exam will cover all topics of the unit

On successful completion you will be able to:

- demonstrate a well- developed knowledge of the principles, concepts and techniques of a broad range of areas in analysis and applied mathematics, with significant depth in analysis and functional analysis.
- demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other related fields of study.
- construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
- formulate and model practical and abstract problems in mathematical terms using a variety of methods drawn from analysis and functional analysis.
- apply mathematical principles, concepts, techniques and technology efficiently to solve practical and abstract problems across a range of areas in analysis and functional analysis.
- interpret mathematical information communicated in wide range of forms.

¹ 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.

² 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 are one 2-hour lecture each week and one 1-hour SGTA. We refer to i-learn for the details of timetable.

Lecture notes will be available on iLearn.

The following texts are suggested for reference only, and it is not essential to own copies:

Lay: Analysis with an introduction to proof

Gordon: Real Analysis, A First course

Burkill: A First Course in Mathematical Analysis

Burkill and Burkill: A Second Course in Mathematical Analysis

Young: An Introduction to Hilbert Space

Unit Schedule

Week	Topic	Assessment Due
	The real number system.	
	Sequences.	
	Series	
	Continuity	
	Differentiation	
	Integration	
	Mid session Break	
	Metric spaces, open and closed sets, limits and continuity	Assignment 1
	Open and closed sets, limits and continuity	
	Connectedness, completeness, compactness, continuous functions with compact domains	
	Normed vector spaces, Banach spaces	iLearn Test
	Inner product spaces, Hilbert spaces	
	Linear functionals, dual space	Assignment 2
	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](#)
- [Grade Appeal Policy](#)
- [Complaint Management 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 or if you are a Global MBA student contact globalmba.support@mq.edu.au

Student Support

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

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [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

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

IT Help

For help with University computer systems and technology, visit 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.

Changes since First Published

Date	Description
13/07/2021	updated unit schedule