MATH235

Mathematics IIA

S2 Day 2017

Dept of Mathematics

Contents

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General Information

Unit convenor and teaching staff
Student Support Officer
Garry Lawson
garry.lawson@mq.edu.au
Contact via garry.lawson@mq.edu.au
E7A
All week days from 10:00 to 17:00

Convenor and Lecturer
Stuart Hawkins
stuart.hawkins@mq.edu.au
E7A 722
Friday 9am-10am

Lecturer
Anh Bui
the.bui@mq.edu.au
E7A 719
Wednesday or by appointment

Credit points
3

Prerequisites
MATH133 or MATH136

Corequisites

Co-badged status

Unit description
The idea of a vector space first introduced in MATH136 and MATH133 is enriched in this unit by the introduction of an inner product. This leads to the important notion of orthogonality that underpins many areas of mathematics. The idea of linear transformations which transfer linearity from one space to another is also discussed. The results and techniques are then applied to problems such as approximation, quadratic forms and Fourier series. Differential and integral calculus involving functions of several real variables are discussed in greater depth than in MATH136 and MATH133. The ideas here are central to the development of mathematics in many different directions.

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:

Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.

Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.

Understanding logical arguments and recognising any gaps or faults in such arguments.

Expressing yourself clearly and logically in writing.

General Assessment Information

HURDLES: This unit has no hurdle requirements. This means that there are no second chance examinations and assessments if you happen to fail at your first attempt, and your final grade is determined by adding the marks obtained for your examinations and assessments. Students should aim to get at least 60% for the course work in order to be reasonably confident of passing the unit.

IMPORTANT: If you apply for Disruption to Study for your final examination, you <u>must</u> make yourself available for the week of December 11 – 15, 2017. If you are not available at that time, there is no guarantee an additional examination time will be offered. Specific examination dates and times will be determined at a later date.

Assessment Tasks

Name	Weighting	Hurdle	Due
3 Assignments	30%	No	See the iLearn for details
Exam	40%	No	Examination period
One Test	15%	No	Week 9
Tutorial participation	15%	No	Weekly

3 Assignments

Due: **See the iLearn for details**
Weighting: **30%**

Assignments on Algebra and Calculus.

On successful completion you will be able to:
- Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
- Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.
- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Expressing yourself clearly and logically in writing.

Exam

Due: **Examination period**
Weighting: **40%**

Final exam

On successful completion you will be able to:
- Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
- Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.
- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Expressing yourself clearly and logically in writing.

One Test

Due: **Week 9**
Weighting: **15%**

Supervised in class test.

On successful completion you will be able to:
- Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
- Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.
- Understanding logical arguments and recognising any gaps or faults in such arguments.

- Expressing yourself clearly and logically in writing.

Tutorial participation

Due: **Weekly**

Weighting: **15%**

Recorded tutorial attendance and marked post-tutorial questions. Only students who attend the whole tutorial session can submit post-tutorial work and receive marks for tutorial participation.

On successful completion you will be able to:

- Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
- Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.
- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Expressing yourself clearly and logically in writing.

Delivery and Resources

The required texts for MATH235 for this session are

- Anton & Rorres: Elementary Linear Algebra, Applications Version , 11th Edition, Wiley 2014
- Hughes Hallett et al : Calculus Single and Multivariable, 6th Edition, Wiley 2014

They are available from the CO-OP Bookshop on campus, among other places.

Digital versions can be obtained from the publisher; see here.

Unit Schedule

See on iLearn a weekly schedule of topics to be covered in the unit.

Learning and Teaching Activities

Lectures

There will be four one hour lectures per week, where the concepts are introduced, explained and illustrated. During these the content of the unit will be explained and example problems will be solved and applications in other disciplines discussed.

Tutorials

There will be one compulsory one-hour tutorial class per week. The tutorial questions will be available on iLearn by the end of the previous week. Each set of tutorial questions will contain: i)

A preparatory set of questions to be completed before the tutorial to reinforce the basic concepts in the previous weeks lectures. You will be given short answers to these questions at the beginning of the tutorial to allow you to check your own work; ii) A set of questions that will discussed in the tutorial. Mathematics is best learnt by active participation in solving problems, and you will gain the most benefit from the tutorials by actively participating in the discussion of these problems and asking for clarification of things you do not understand. Your tutor will guide you to ensure that the class develops coherent, well presented answers; iii) A set of further challenge problems to enable you to further develop your understanding after the tutorial. If time permits, some of these questions may be considered in the tutorial; iv) One or two homework problems, similar to those discussed in the tutorial, to be handed in at the next tutorial for marking. These are designed to provide you with timely feedback on the development of your skills and understanding. We will use the 8 best marks from the weekly homework to determine the tutorial component of your grade. Your homework will only be marked if you attend and participate in the entire tutorial. The mathematics department considers that using only the best 8 marks is a sufficient remedy for any disruption that may occur to a student. A set of model answers for the tutorial questions will be posted on iLearn at the end of each week. Model answers for the marked homework will be provided on the following week.

Assignments

There will be three assignments in this unit. Assignment questions will be made available on iLearn after the material required to answer them has been covered in lectures and at least two weeks before the due date. While we encourage collaborative learning, these are individual assignments, and the work you submit must be your own work. For your own protection, we advise all students participating in group study sessions related to assignment questions to ensure that all participants in such groups destroy any notes they have made at the end of such a session. Participants can then independently construct their own solutions based on the understanding and insight provided by the study session without running the risk of breaching the rules relating to academic misconduct.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy_2016.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in *iLearn*, 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.

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 improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

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

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.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be

imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
- Understanding logical arguments and recognising any gaps or faults in such arguments.

Assessment tasks

- 3 Assignments
- Exam
- One Test
- Tutorial participation

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcome

- Understanding logical arguments and recognising any gaps or faults in such arguments.

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Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary

solutions to problems.

This graduate capability is supported by:

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Learning and teaching activities

- There will be four one hour lectures per week, where the concepts are introduced, explained and illustrated. During these the content of the unit will be explained and example problems will be solved and applications in other disciplines discussed.
- There will be one compulsory one-hour tutorial class per week. The tutorial questions will be available on iLearn by the end of the previous week. Each set of tutorial questions will contain: i) A preparatory set of questions to be completed before the tutorial to reinforce the basic concepts in the previous weeks lectures. You will be given short answers to these questions at the beginning of the tutorial to allow you to check your own work; ii) A set of questions that will discussed in the tutorial. Mathematics is best learnt by active participation in solving problems, and you will gain the most benefit from the tutorials by actively participating in the discussion of these problems and asking for clarification of things you do not understand. Your tutor will guide you to ensure that the class develops coherent, well presented answers; iii) A set of further challenge problems to enable you to further develop your understanding after the tutorial. If time permits, some of these questions may be considered in the tutorial; iv) One or two homework problems, similar to those discussed in the tutorial, to be handed in at the next tutorial for marking. These are designed to provide you with timely feedback on the development of your skills and understanding. We will use the 8 best marks from the weekly homework to determine the tutorial component of your grade. Your homework will only be marked if you attend and participate in the entire tutorial. The mathematics department considers that using only

the best 8 marks is a sufficient remedy for any disruption that may occur to a student. A set of model answers for the tutorial questions will be posted on iLearn at the end of each week. Model answers for the marked homework will be provided on the following week.

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

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Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

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Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Expressing yourself clearly and logically in writing.

Assessment tasks

- 3 Assignments

- Exam
- One Test
- Tutorial participation

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