MATH135

Mathematics IA

S2 Day 2019

Dept of Mathematics and Statistics

Contents

General Information

Unit convenor and teaching staff
Unit Convenor & Lecturer
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Credit points
3

Prerequisites
(HSC Mathematics Band 4-6 or Extension 1 Band E2-E4 or Extension 2) or WFMA003 or MATH130 or MATH123(HD) or WMAT123(HD)

Corequisites

Co-badged status

Unit description
This is the first mainstream university mathematics unit; it is essential for students in engineering and many areas of science. We start with exploring the concept of a function, and continue with the notions of limit and continuity, developed to a reasonably sophisticated level. We then define the concept of derivative as a suitable construct to describe rates of change, develop the differential and integral calculus of functions of a real variable, and discuss some simple differential equations and their role as quantitative models for dynamic processes. We also study the use of vectors in two and three-dimensional Euclidean geometry, and relate this to the algebraic process of solving linear systems in several variables.

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:

At the end of this unit, students will be able to exploit simple computational methods to solve the problems and implement the techniques studied in this unit.

At the end of this unit, students will be able to express mathematical ideas clearly and logically, and provide appropriate justification for their conclusions.

At the end of this unit, students will be able to have a reasonable understanding about the applications of these concepts and techniques in other disciplines, in particular in Physics and Engineering.

At the end of this unit, students will be able to understand and construct elementary mathematical arguments, using the concepts and techniques studied in this unit.

At the end of this unit, students will be able to demonstrate an understanding of the key concepts of the integral as accumulated change, and be able to calculate integrals of a wide range of functions, using the relevant methods. Students will be able to solve a broad range of mathematical problems involving integration.

At the end of this unit, students will be able to demonstrate an understanding of the key concepts of the derivative as a rate of change, and be able to calculate derivatives for a wide range of functions, using the relevant methods. Students will be able to solve a broad range of mathematical problems involving differentiation.

At the end of this unit, students will be able to demonstrate a well-developed knowledge of the elementary principles, concepts and techniques of calculus, using a range of relevant algebraic techniques, and understand the behaviour of the standard elementary mathematical functions under these operations.

At the end of this unit, students will be able to demonstrate an understanding of the key concepts of limits and continuity, and be able to compute a wide range of limits.

At the end of this unit, students will be able to demonstrate foundational learning skills including active engagement in their learning process.

General Assessment Information

HURDLES: From week 2, participation in a weekly Small Group Teaching Activity (SGTA) is **compulsory**. Participation will be assessed by observation of students' work during classes and through presentation of work completed prior to the SGTA. Participation and reasonable

engagement in the class activities in at least 10 out of 12 SGTA's are requirements to pass the unit. This is a hurdle requirement.

Achieving a pass grade (50%) or higher in the Matlab Assignment is a hurdle requirement.

ATTENDANCE and PARTICIPATION: Please contact the unit convenor as soon as possible if you have difficulty attending and participating in any classes. There may be alternatives available to make up the work. If there are circumstances that mean you miss a class, you can apply for a Special Consideration.

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
SGTA Participation	0%	Yes	weekly (from Wk 2)
Test 1 (in lecutre)	20%	No	Week 5 (9am Wed 28 August)
Test 2 (in lecture)	20%	No	Week 11 (11am Fri 25 October)
Assignment	10%	Yes	Thu 31 October, 22:00 (Wk12)
Final exam	50%	No	final exam period

SGTA Participation

Due: **weekly (from Wk 2)**
Weighting: **0%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Participation will be assessed by observation of students' work during classes and through presentation of work completed prior to the SGTA. Participation and reasonable engagement in the class activities in at least 10 out of 12 SGTA's are requirements to pass the unit. This is a hurdle requirement.

On successful completion you will be able to:

- At the end of this unit, students will be able to exploit simple computational methods to solve the problems and implement the techniques studied in this unit.
- At the end of this unit, students will be able to express mathematical ideas clearly and logically, and provide appropriate justification for their conclusions.
- At the end of this unit, students will be able to have a reasonable understanding about the applications of these concepts and techniques in other disciplines, in particular in Physics and Engineering.
- At the end of this unit, students will be able to demonstrate an understanding of the key

concepts of the integral as accumulated change, and be able to calculate integrals of a wide range of functions, using the relevant methods. Students will be able to solve a broad range of mathematical problems involving integration.
- At the end of this unit, students will be able to demonstrate an understanding of the key concepts of the derivative as a rate of change, and be able to calculate derivatives for a wide range of functions, using the relevant methods. Students will be able to solve a broad range of mathematical problems involving differentiation.
- At the end of this unit, students will be able to demonstrate an understanding of the key concepts of limits and continuity, and be able to compute a wide range of limits.
- At the end of this unit, students will be able to demonstrate foundational learning skills including active engagement in their learning process.

Test 1 (in lecutre)

Due: **Week 5 (9am Wed 28 August)**
Weighting: **20%**

Test on material covered in Week 1 through Week 4. Test will be run during lecture. See iLearn for more details.

On successful completion you will be able to:

- At the end of this unit, students will be able to express mathematical ideas clearly and logically, and provide appropriate justification for their conclusions.
- At the end of this unit, students will be able to have a reasonable understanding about the applications of these concepts and techniques in other disciplines, in particular in Physics and Engineering.
- At the end of this unit, students will be able to understand and construct elementary mathematical arguments, using the concepts and techniques studied in this unit.
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- At the end of this unit, students will be able to demonstrate a well-developed knowledge of the elementary principles, concepts and techniques of calculus, using a range of

relevant algebraic techniques, and understand the behaviour of the standard elementary mathematical functions under these operations.
- At the end of this unit, students will be able to demonstrate foundational learning skills including active engagement in their learning process.

Test 2 (in lecture)

Due: **Week 11 (11am Fri 25 October)**
Weighting: **20%**

Test on material covered in Week 5 through Week 10 (though will assume knowledge of material covered in Week 1 through Week 4). Test will be run during lecture. See iLearn for more details.

On successful completion you will be able to:

- At the end of this unit, students will be able to express mathematical ideas clearly and logically, and provide appropriate justification for their conclusions.
- At the end of this unit, students will be able to have a reasonable understanding about the applications of these concepts and techniques in other disciplines, in particular in Physics and Engineering.
- At the end of this unit, students will be able to understand and construct elementary mathematical arguments, using the concepts and techniques studied in this unit.
- At the end of this unit, students will be able to demonstrate an understanding of the key concepts of the integral as accumulated change, and be able to calculate integrals of a wide range of functions, using the relevant methods. Students will be able to solve a broad range of mathematical problems involving integration.
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- At the end of this unit, students will be able to demonstrate a well-developed knowledge of the elementary principles, concepts and techniques of calculus, using a range of relevant algebraic techniques, and understand the behaviour of the standard elementary mathematical functions under these operations.
- At the end of this unit, students will be able to demonstrate an understanding of the key concepts of limits and continuity, and be able to compute a wide range of limits.
- At the end of this unit, students will be able to demonstrate foundational learning skills including active engagement in their learning process.

Assignment

Due: **Thu 31 October, 22:00 (Wk12)**
Weighting: **10%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Achieving a pass grade (50%) or higher in the Matlab Assignment is a hurdle requirement.

On successful completion you will be able to:

- At the end of this unit, students will be able to exploit simple computational methods to solve the problems and implement the techniques studied in this unit.
- At the end of this unit, students will be able to express mathematical ideas clearly and logically, and provide appropriate justification for their conclusions.
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Final exam

Due: **final exam period**
Weighting: **50%**

Final examination covering all material in the course.

On successful completion you will be able to:

- At the end of this unit, students will be able to express mathematical ideas clearly and logically, and provide appropriate justification for their conclusions.

- At the end of this unit, students will be able to have a reasonable understanding about the applications of these concepts and techniques in other disciplines, in particular in Physics and Engineering.
- At the end of this unit, students will be able to understand and construct elementary mathematical arguments, using the concepts and techniques studied in this unit.
- At the end of this unit, students will be able to demonstrate an understanding of the key concepts of the integral as accumulated change, and be able to calculate integrals of a wide range of functions, using the relevant methods. Students will be able to solve a broad range of mathematical problems involving integration.
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- At the end of this unit, students will be able to demonstrate an understanding of the key concepts of limits and continuity, and be able to compute a wide range of limits.
- At the end of this unit, students will be able to demonstrate foundational learning skills including active engagement in their learning process.

Delivery and Resources

Delivery: Day, Internal.

Classes: Students are strongly encouraged to attend all four lectures each week.

Small group Teaching Activity (SGTA): You should attend and participate in one SGTA each week, starting from week 2, this is compulsory. Students have to participate in the SGTA in which they are enrolled. Any variation to this has to be approved by the convenor**.**

This unit will use: iLearn; students need regular access to a reliable internet connection. Matlab; students need regular access to the computer program Matlab (available for download onto personally owned devices, and on computers around campus).

Textbook: Algebra - *Lay*, Linear Algebra and its Applications, 5th edition. Calculus - *Stewart*, Calculus (Metric Version), 8th edition.

Unit Schedule

WEEK		Algebra	Calculus	

1		Sets, matrices	Functions
2		Matrices, linear equations	Functions
3		Linear equations	Functions
4		Determinants, vectors	Differentiation: Limits
5		Vectors	Continuity & Differentiability
6		Vectors, lines	Differentiation: Techniques
7		Planes, optimisation	Integration: Sums & Definite Integral
8		Optimisation	Integration: Fundamental Thm of Calculus
9		Optimisation	Integration: Fundamental Thm of Calculus
10		Differential equations	Integration: Techniques
11		Differential equations	Integration: Techniques
12		Differential equations, volumes	Integration: Techniques

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.

Small Group Teaching Activity (SGTA)

There will be one compulsory one-hour SGTA per week, from week 2. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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 *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

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

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/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 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

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.

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

- At the end of this unit, students will be able to exploit simple computational methods to solve the problems and implement the techniques studied in this unit.
- At the end of this unit, students will be able to express mathematical ideas clearly and logically, and provide appropriate justification for their conclusions.
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- At the end of this unit, students will be able to demonstrate an understanding of the key concepts of limits and continuity, and be able to compute a wide range of limits.
- At the end of this unit, students will be able to demonstrate foundational learning skills including active engagement in their learning process.

Assessment tasks

- SGTA Participation
- Test 2 (in lecture)

- Final exam

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 SGTA per week, from week 2. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

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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:

Learning outcomes

- At the end of this unit, students will be able to exploit simple computational methods to solve the problems and implement the techniques studied in this unit.
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Assessment tasks

- SGTA Participation
- Test 1 (in lecutre)
- Test 2 (in lecture)
- Assignment

- Final exam

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 SGTA per week, from week 2. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.

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.

This graduate capability is supported by:

Learning outcomes

- At the end of this unit, students will be able to exploit simple computational methods to solve the problems and implement the techniques studied in this unit.
- At the end of this unit, students will be able to express mathematical ideas clearly and logically, and provide appropriate justification for their conclusions.
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- There will be one compulsory one-hour SGTA per week, from week 2. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.

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.

This graduate capability is supported by:

Learning outcomes

- At the end of this unit, students will be able to exploit simple computational methods to solve the problems and implement the techniques studied in this unit.
- At the end of this unit, students will be able to express mathematical ideas clearly and logically, and provide appropriate justification for their conclusions.
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- 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 SGTA per week, from week 2. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.

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

- At the end of this unit, students will be able to exploit simple computational methods to solve the problems and implement the techniques studied in this unit.
- At the end of this unit, students will be able to express mathematical ideas clearly and logically, and provide appropriate justification for their conclusions.
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