



MATH135

Mathematics IA

S2 Day 2017

Dept of Mathematics

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Disclaimer

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General Information

Unit convenor and teaching staff

Convener

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Contact via email

Room 618, 12 Wally's Walk

Monday 12pm - 1pm

Lecturer

Jim Denier

jim.denier@mq.edu.au

Contact via email

Room 603, 12 Wally's Walk

Wednesday 12 pm - 1pm

Credit points

3

Prerequisites

(HSC Mathematics Band 4-6 or Extension 1 Band E2-E4 or Extension 2) or MATH130 or MATH123(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:

By the end of this unit, you should 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.

Demonstrate an understanding of the key concepts of limit and continuity, and be able to compute a wide range of limits.

Demonstrate an understanding of the key concept of derivative as a rate of change, and be able to calculate derivatives for a wide range of functions, using the relevant methods. Be able to solve a broad range of mathematical problems involving differentiation.

Demonstrate an understanding of the key concept of integral as accumulated change, and be able to calculate integrals of a wide range of functions, using the relevant methods. Be able to solve a broad range of mathematical problems involving integration.

Understanding and constructing elementary mathematical arguments, using the concepts and techniques studied in this unit.

Have a reasonable understanding about the applications of these concepts and techniques in other disciplines, in particular in Physics and Engineering.

Expressing mathematical ideas clearly and logically and provide appropriate justification for your conclusions.

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 must 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
Assignments	30%	No	See iLearn

Name	Weighting	Hurdle	Due
<u>Tutorial work</u>	20%	No	Weekly
<u>Exam</u>	40%	No	End-of-semester
<u>Midterm Test</u>	10%	No	See iLearn

Assignments

Due: **See iLearn**

Weighting: **30%**

Three assignments

On successful completion you will be able to:

- By the end of this unit, you should 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.
- Demonstrate an understanding of the key concepts of limit and continuity, and be able to compute a wide range of limits.
- Demonstrate an understanding of the key concept of derivative as a rate of change, and be able to calculate derivatives for a wide range of functions, using the relevant methods. Be able to solve a broad range of mathematical problems involving differentiation.
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- Expressing mathematical ideas clearly and logically and provide appropriate justification for your conclusions.

Tutorial work

Due: **Weekly**

Weighting: **20%**

Compulsory weekly tutorial classes and post-tutorial assessment.

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Exam

Due: **End-of-semester**

Weighting: **40%**

Supervised exam

On successful completion you will be able to:

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- Demonstrate an understanding of the key concepts of limit and continuity, and be able to compute a wide range of limits.
- Demonstrate an understanding of the key concept of derivative as a rate of change, and be able to calculate derivatives for a wide range of functions, using the relevant methods. Be able to solve a broad range of mathematical problems involving differentiation.

- Demonstrate an understanding of the key concept of integral as accumulated change, and be able to calculate integrals of a wide range of functions, using the relevant methods. Be able to solve a broad range of mathematical problems involving integration.
- Understanding and constructing elementary mathematical arguments, using the concepts and techniques studied in this unit.
- Expressing mathematical ideas clearly and logically and provide appropriate justification for your conclusions.

Midterm Test

Due: **See iLearn**

Weighting: **10%**

A 45 minute test, conducted during tutorial time.

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- Demonstrate an understanding of the key concepts of limit and continuity, and be able to compute a wide range of limits.
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Delivery and Resources

Delivery: Day, Internal.

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

Tutorials: You should attend one tutorial each week. Tutorial classes are compulsory. Students have to attend the tutorial class in which they are enrolled. Any variation to this has to be approved by the convenor.

MATH135 Workshops: available for students wanting to see more examples and ask further questions; organized by the Numeracy Centre.

This unit will use: iLearn. Students need regular access to a reliable internet connection.

Textbook: *Calculus - Single & Multivariable*, Hughes-Hallett, Gleason & McCallum. 2013 (7th edition), Wiley.

Unit Schedule

Week	Topic
1	Review of assumed material
2	Functions and Trigonometry
3	Trigonometry
4	Limits and Continuity
5	Differentiation: rates, definition, properties
6	Differentiation: Mean Value Theorem and Implicit
7	Integration: accumulated change, definition, properties
8	Integration: techniques and applications
9	Vectors and Geometry
10	Systems of Linear Equations
11	Differential equations: introduction, separable, Linear first order
12	Combinatorics, Induction, Binomial Theorem

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.

Tutorial classes

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 • 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. • 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. • A set of further 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. • 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 an understanding of the key concepts of limit and continuity, and be able to compute a wide range of limits.
- Demonstrate an understanding of the key concept of derivative as a rate of change, and be able to calculate derivatives for a wide range of functions, using the relevant methods. Be able to solve a broad range of mathematical problems involving differentiation.
- Demonstrate an understanding of the key concept of integral as accumulated change, and be able to calculate integrals of a wide range of functions, using the relevant methods. Be able to solve a broad range of mathematical problems involving integration.
- Understanding and constructing elementary mathematical arguments, using the concepts and techniques studied in this unit.
- Have a reasonable understanding about the applications of these concepts and techniques in other disciplines, in particular in Physics and Engineering.

Assessment tasks

- Assignments
- Tutorial work
- Exam
- Midterm Test

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
 - 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.
 - A set of questions that will be 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.
 - A set of further 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. • 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.

- 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

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 outcomes

- Have a reasonable understanding about the applications of these concepts and techniques in other disciplines, in particular in Physics and Engineering.
- Expressing mathematical ideas clearly and logically and provide appropriate justification for your conclusions.

Learning and teaching activities

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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

- By the end of this unit, you should 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.
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- Understanding and constructing elementary mathematical arguments, using the concepts and techniques studied in this unit.

Assessment tasks

- Assignments
- Tutorial work
- Midterm Test

Learning and teaching activities

- 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

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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.

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Learning outcomes

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- Demonstrate an understanding of the key concepts of limit and continuity, and be able to compute a wide range of limits.
- Demonstrate an understanding of the key concept of derivative as a rate of change, and be able to calculate derivatives for a wide range of functions, using the relevant methods. Be able to solve a broad range of mathematical problems involving differentiation.
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Assessment tasks

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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.
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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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Learning outcomes

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- Demonstrate an understanding of the key concepts of limit and continuity, and be able to

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- Understanding and constructing elementary mathematical arguments, using the concepts and techniques studied in this unit.
- Have a reasonable understanding about the applications of these concepts and techniques in other disciplines, in particular in Physics and Engineering.
- Expressing mathematical ideas clearly and logically and provide appropriate justification for your conclusions.

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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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Learning outcomes

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Be able to solve a broad range of mathematical problems involving differentiation.

- Demonstrate an understanding of the key concept of integral as accumulated change, and be able to calculate integrals of a wide range of functions, using the relevant methods. Be able to solve a broad range of mathematical problems involving integration.
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- Have a reasonable understanding about the applications of these concepts and techniques in other disciplines, in particular in Physics and Engineering.
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 - 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.

- 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

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

- By the end of this unit, you should 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.
- Demonstrate an understanding of the key concepts of limit and continuity, and be able to compute a wide range of limits.
- Demonstrate an understanding of the key concept of integral as accumulated change, and be able to calculate integrals of a wide range of functions, using the relevant methods. Be able to solve a broad range of mathematical problems involving integration.
- Understanding and constructing elementary mathematical arguments, using the concepts and techniques studied in this unit.

- Have a reasonable understanding about the applications of these concepts and techniques in other disciplines, in particular in Physics and Engineering.
- Expressing mathematical ideas clearly and logically and provide appropriate justification for your conclusions.

Assessment tasks

- Assignments
- Tutorial work
- Exam
- Midterm Test

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
 - 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.
 - A set of questions that will be 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.
 - A set of further 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.
 - 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.

- 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

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcome

- Expressing mathematical ideas clearly and logically and provide appropriate justification for your conclusions.

Assessment tasks

- Assignments
- Tutorial work
- Exam
- Midterm Test

Learning and teaching activities

- 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 • 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. • 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.

- A set of further 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.
- 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.

- 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

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcome

- Expressing mathematical ideas clearly and logically and provide appropriate justification for your conclusions.

Assessment tasks

- Assignments
- Tutorial work