



# MATH135

## Mathematics IA

S2 Day 2015

*Dept of Mathematics*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff

Lecturer

Stuart Hawkins

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Credit points

3

Prerequisites

HSC Mathematics Band 4 or HSC Mathematics Extension 1 Band E2 or HSC Mathematics Extension 2 or MATH130 or MATH123(HD)

Corequisites

Co-badged status

Unit description

This is the first mainstream mathematics unit. It is essential for students in science and technology, and recommended for students in many other areas who wish to enhance their mathematical skills. Apart from some brief discussion on complex numbers and congruences, the main topic in the algebra half of this unit concerns linearity and the interplay between algebra and geometry. Plane geometry is first used to motivate the study of systems of linear equations. Algebraic techniques involving matrices and determinants are then developed to study these problems further. The algebraic machinery developed is then used to study geometrical problems in 3-dimensional space. The notion of a limit is developed to a more sophisticated level than in secondary school mathematics, and this is used to study the differential and integral calculus involving functions of one real variable to a far greater depth than before. Some simple numerical techniques on integration are also discussed.

## 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.

## Assessment Tasks

Name	Weighting	Due
<a href="#">Assignments</a>	18%	See unit website
<a href="#">Tutorial work</a>	20%	Ongoing
<a href="#">Quizzes</a>	2%	See unit website
<a href="#">Test</a>	20%	See unit website
<a href="#">Exam</a>	40%	End-of-semester

### Assignments

Due: **See unit website**

Weighting: **18%**

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.
- 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.

## Tutorial work

Due: **Ongoing**

Weighting: **20%**

Compulsory weekly two-hour tutorial classes

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.
- 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.

## Quizzes

Due: **See unit website**

Weighting: **2%**

Online quizzes; 1% each when completed by the due date

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.
- 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.

## Test

Due: **See unit website**

Weighting: **20%**

Supervised mid-semester test

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.
- 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.

## Exam

Due: **End-of-semester**

Weighting: **40%**

Supervised exam

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

## 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; organised by the Numeracy Centre. Attendance is strongly recommended.

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

**Recommended textbook:** Hughes-Hallett, Gleason & McCallum. 2013 (6th edition). Calculus - Single & Multivariable. Wiley.

## 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 two-hour tutorial class per week. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.

### MATH135 Workshop

There is a weekly optional workshop provided by the Numeracy Centre.

## 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](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

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

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

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

Grievance Management Policy [http://mq.edu.au/policy/docs/grievance\\_management/policy.html](http://mq.edu.au/policy/docs/grievance_management/policy.html)

Disruption to Studies Policy [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html) *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

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/](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://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use 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**

- 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

## **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 two-hour tutorial class per week. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.
- There is a weekly optional workshop provided by the Numeracy Centre.

## **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.

## **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 and teaching activities

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

## 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

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## Assessment tasks

- Assignments
- Tutorial work
- Quizzes

- Test
- Exam

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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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- 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.

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

## Assessment tasks

- Assignments
- Tutorial work
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- Exam

## Learning and teaching activities

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- There is a weekly optional workshop provided by the Numeracy Centre.

## 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 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
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- There will be one compulsory two-hour tutorial class per week. During this time students will discuss problems related to the previous week's lecture content and work through similar problems.
- There is a weekly optional workshop provided by the Numeracy Centre.

## 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

## Learning and teaching activities

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

## 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

### Extra requirements

Satisfactory performance on supervised assessment tasks, that is the test and the final exam, is necessary to pass this unit. Students who do not meet this requirement will have their grade capped at F49 (Fail 49%). In addition, in order to obtain a passing grade in this unit, students are required to demonstrate their mastery of the required basic skills and techniques by passing all on-line quizzes. Again, students who do not meet this requirement will have their grade capped at F49.