Contents

General Information .................................................. 2
Learning Outcomes ..................................................... 3
General Assessment Information ................................. 3
Assessment Tasks ....................................................... 3
Delivery and Resources ............................................... 6
Unit Schedule .......................................................... 7
Learning and Teaching Activities ................................. 7
Policies and Procedures ............................................... 8
Graduate Capabilities ................................................ 9
### General Information

Unit convenor and teaching staff  
**Lecturer**  
Sophie Calabretto  
*sophie.calabretto@mq.edu.au*  
Contact via email  
AHH 2.603  
By appointment

**Lecturer**  
Adam Tunney  
*adam.tunney@mq.edu.au*  
Contact via email  
AHH Level 2  
By appointment

Sophie Calabretto  
*sophie.calabretto@mq.edu.au*

---

**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://students.mq.edu.au/important-dates

Learning Outcomes

1. 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.

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

3. 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.

4. 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.

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

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

7. 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. 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 July 24 – 28, 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

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>30%</td>
<td>No</td>
<td>See iLearn</td>
</tr>
</tbody>
</table>

https://unitguides.mq.edu.au/unit_offerings/72949/unit_guide/print
### Assignments

**Due:** See iLearn  
**Weighting:** 30%  
Three assignments

This Assessment Task relates to the following 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 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:** Weekly  
**Weighting:** 20%

Compulsory weekly two-hour tutorial classes and in tutorial assessment.
This Assessment Task relates to the following 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 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.

Exam

Due: End-of-semester
Weighting: 40%

Supervised exam

This Assessment Task relates to the following 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 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.

This Assessment Task relates to the following 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 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.
• 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.

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. Attendance is strongly recommended.

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


Unit Schedule

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

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:


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

Equity 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.

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

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

• 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.
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 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.

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.
• 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**

- 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 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.

**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 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.
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 systematically 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

• 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

• 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 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.

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 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
- Exam
- Midterm Test

**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
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.
- 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.

**Assessment tasks**

- Assignments
- Tutorial work
- Midterm Test

**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.