



# MATH123

## Mathematics 123

MQC3 Day 2015

*Dept of Mathematics*

## Contents

<u>General Information</u>	2
<u>Learning Outcomes</u>	2
<u>Assessment Tasks</u>	3
<u>Delivery and Resources</u>	6
<u>Unit Schedule</u>	8
<u>Learning and Teaching Activities</u>	8
<u>Policies and Procedures</u>	9
<u>Graduate Capabilities</u>	10
<u>Extra requirements</u>	17

### Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

## General Information

Unit convenor and teaching staff Matthew Tydd <a href="mailto:matthew.tydd@mq.edu.au">matthew.tydd@mq.edu.au</a>
Credit points 3
Prerequisites
Corequisites
Co-badged status
<p>Unit description</p> <p>This unit introduces students to a range of mathematical techniques from algebra and calculus. Its focus is on the modern application of these ideas, with a particular emphasis on applications to problems in economics, business and finance, and provides a sound mathematical basis for further study in these areas. Topics include algebra relevant to basic financial mathematics, the development of the techniques of differentiation and integration with applications to constrained and unconstrained optimisation, including multivariable cases, and the development and application of a variety of useful approximation techniques. A key focus of the unit is the development of a clear understanding of the role that mathematics plays in modern society, and the development of a sound grasp of how mathematics is used to provide sophisticated modelling of complex real problems.</p> <p>While the mathematical content of this unit has considerable overlap with the mathematical content of MATH130, the flavour with which the material is presented is such that this unit is the appropriate choice for economics, business and finance students, while students who wish to pursue study in science will be better served by studying MATH130.</p>

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.

Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role

of mathematics and the way it contributes the development in other fields of study.

Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning

Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.

Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.

Appropriately interpret mathematical models communicated in wide range of forms.

Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.

Work effectively, responsibly and safely in individual and team contexts.

## Assessment Tasks

Name	Weighting	Due
<u>Five Im class Quizzes</u>	10%	TBA
<u>Two Tests</u>	15%	TBA
<u>Final examination</u>	60%	University Examination Period
<u>Quizzes</u>	0%	No due date
<u>Essay</u>	15%	TBA

### Five Im class Quizzes

Due: **TBA**

Weighting: **10%**

Assignments

On successful completion you will be able to:

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments

incorporating deductive reasoning

- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

## Two Tests

Due: **TBA**

Weighting: **15%**

Tests in tutorials

On successful completion you will be able to:

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

## Final examination

Due: **University Examination Period**

Weighting: **60%**

Final examination

On successful completion you will be able to:

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

## Quizzes

Due: **No due date**

Weighting: **0%**

Online quizzes. Students must pass all quizzes to be eligible to pass the unit.

On successful completion you will be able to:

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning

- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

## Essay

Due: **TBA**

Weighting: **15%**

This is a 1200 word essay on a Mathematical Subject or Model.

See iLearn for details

On successful completion you will be able to:

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

## Delivery and Resources

### Classes

**Lectures:** you should attend two hours of each lecture stream each week, making a total of four

hours.

**Tutorials:** you should attend one tutorial each week.

**Workshops:** available for students wanting to see more examples and ask further questions. Attendance is strongly recommended.

## Required and Recommended Texts and/or Materials

The main text for this unit is

- Jacques: *Mathematics for Economics and Business*, 7th edition

Additional required online notes for MATH123 are available for download on

- [\*Elementary Mathematics\*](#) by Chen and Duong
- [\*Math123 Concepts of Algebra\*](#) by C. Cooper
- [\*Math123 Concepts of Calculus\*](#) by C. Cooper

You should download and study these.

The online notes are intended primarily as a source of reference. These are not intended to be treated as the only source for learning.

The same material is covered in many texts. You should try several of these, adopting one which suits your personal style of learning.

The following texts are also recommended for this unit, and are available from the CO-OP Bookshop on campus, and are in the reference section of the Library.

- Stewart, Redlin and Watson; *Precalculus: mathematics for calculus*, 5th edition
- Hughes-Hallett and Gleason; *Calculus: single and multivariable*, 4th edition

Other similar texts are available in the Library, and for reference in the Numeracy Centre (C5A 225).

## Additional Notes

- [\*Numeracy Centre notes\*](#) on introductory concepts and techniques that are assumed knowledge for MATH123. These notes also cover some of the material in MATH123. Students who have not studied maths for several years, or who did HSC General Mathematics often find these notes helpful.

## Technology Used and Required

Students are expected to have access to an internet enabled computer with a web browser and Adobe Reader software. Several areas of the university provide wireless access for portable computers. There are computers for student use in the Library and in the [\*Numeracy Centre\*](#) (C5A 255).

In order to complete the group work video assessment task, students will need access to a

device capable of recording video and audio, such as a smartphone or computer with a webcam. Students who do not have access to such devices will be assisted in joining a group that does.

**Difficulties with your home computer or internet connection do not constitute a reasonable excuse for lateness of, or failure to submit, assessment tasks.**

## Unit Schedule

	<u>Graphs (Cooper Ch1)</u>	Calculators, decimals, <u>Fractions, real numbers</u> (Jacques 1.1, 1.2)	
	<u>The xy-plane (Cooper Ch2, Jacques 1.3)</u>	<u>Expansions and Factorisation</u> (Jacques 1.1, 1.2, 1.6)	
	<u>Derivatives (Cooper Ch3, Jacques 4.1, 4.2, 4.4)</u>	<u>Powers, Linear equations</u> (Jacques 1.4)	
	<u>Marginals, Tangents and Normals (Cooper Ch4, Jacques 4.1, 4.3)</u>	<u>Linear and Quadratic equations</u> (Jacques 2.1, 2.2)	A1
	<u>Maxima and Minima (Cooper Ch5, Jacques 4.6)</u>	<u>Linear and Quadratic equations</u> (Jacques 2.1, 2.2)	
	<u>Optimisation (Cooper Ch6, Jacques 4.6, 4.7)</u>	<u>exp and log functions</u> (Jacques 2.3, 2.4)	A2
	<u>Integration (Cooper Ch7, Jacques 6.1, 6.2)</u>	<u>exp and log functions</u> (Jacques 2.3, 2.4)	T1
	<u>Exponentials, Logs and Lagrange Multipliers (Cooper Ch8)</u>	<u>Inequalities, absolute value</u> (Jacques 2.3)	A3
	<u>Lagrange Multipliers (Jacques 4.8, 5.1-5.6) and Newton's Method</u>	<u>Progressions: arithmetic and geometric</u> (Jacques 3.3)	
	<u>Newton's Method (Cooper Ch9)</u>	<u>Applications of GPs to finance</u> (Jacques 3.1, 3.2, 3.4)	P1
	<u>Numerical Integration (Cooper Ch11)</u>	<u>Matrices</u> (Jacques 7.1, 7.2)	A4
	<u>Differential Equations (Cooper Ch12)</u>	<u>Matrices and Linear Equations</u> (Jacques 7.1, 7.2)	T2
	<b>Revision</b>		A5

## Learning and Teaching Activities

### Lectures

4 lectures per week



## Tutorial

1 tutorial per week

## 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](http://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](http://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](http://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

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

## Assessment tasks

- Five In class Quizzes
- Two Tests
- Final examination

## 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

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

## Assessment tasks

- Five In class Quizzes
- Two Tests
- Final examination
- Essay

## 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

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

### Assessment tasks

- Quizzes
- Essay

## 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

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

## Assessment tasks

- Five In class Quizzes
- Two Tests
- Final examination
- Quizzes
- Essay

## 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

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.

- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

## **Assessment tasks**

- Five In class Quizzes
- Two Tests
- Final examination
- Essay

## **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**

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.

- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

## **Assessment tasks**

- Five In class Quizzes
- Two Tests
- Final examination
- Quizzes
- Essay

## **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**

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional

work and make ethical decisions while collecting and analysing data and reporting findings.

- Work effectively, responsibly and safely in individual and team contexts.

## Assessment tasks

- Five In class Quizzes
- Two Tests
- Final examination
- Essay

## 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 outcomes

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.



## Assessment tasks

- Five 1m class Quizzes
- Final examination
- Essay

## 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 outcomes

- Demonstrate a well-developed knowledge of the principles, concepts and techniques mathematics as they apply to finance, economics, and the sciences.
- Demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other fields of study.
- Construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning
- Formulate and model "real world" problems, including identifying and applying appropriate mathematical techniques.
- Apply mathematical principles, concepts, techniques and technology efficiently to solve "real world" problems.
- Appropriately interpret mathematical models communicated in wide range of forms.
- Demonstrate an understanding of ethical, social and environmental issues relating to professional mathematical work, identify and address issues arising in such professional work and make ethical decisions while collecting and analysing data and reporting findings.
- Work effectively, responsibly and safely in individual and team contexts.

## Assessment task

- Essay

## Extra requirements

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 six on-line quizzes. Students who do not meet this requirement will have their grade capped at F 49.

Satisfactory performance on supervised assessment tasks, such as tests and the final exam, is necessary to pass this unit. If there is a significant difference between a student's marks on supervised assessment tasks and on unsupervised assessment tasks, the scaling of these tasks may be adjusted when determining the final grade, to reflect more appropriately that student's performance on supervised tasks.