



# MATH1000

## Introduction to Mathematical Modelling

Session 2, Special circumstance 2020

*Department of Mathematics and Statistics*

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#### 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.

#### Notice

As part of [Phase 3 of our return to campus plan](#), most units will now run tutorials, seminars and other small group learning activities on campus for the second half-year, while keeping an online version available for those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face and online activities for your unit, please go to [timetable viewer](#). To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

## General Information

Unit convenor and teaching staff

Unit convenor & Lecturer

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Credit points

10

Prerequisites

Corequisites

Co-badged status

Unit description

This unit is an elementary unit designed for Engineering, Mathematics and Physics students whose mathematics background has not met the recommended standard for students entering these programs. One half of the unit provides an introduction to the ideas and techniques of differentiation and integration which are pervasive in the theoretical and practical models that underpin areas of science, engineering, economics and technology. The other half of the unit develops the algebraic skills and techniques including exponential, logarithmic, and trigonometric functions.

## 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:

**ULO1:** Perform calculations, including rates of changes and integrals, of elementary functions used in science and economics (including linear, polynomial, exponential, logarithmic, and trigonometric) and interpret results of these calculations.

**ULO2:** Communicate mathematical concepts, pertaining to foundation level science topics, in a variety of forms including graphically, numerically, in writing and by using equations.

**ULO3:** Apply mathematical reasoning to simple problem solving in the context of elementary algebra and calculus.

**ULO4:** Test mathematical conjectures involving elementary functions.

**ULO5:** Demonstrate foundational learning skills including active engagement in the learning process.

**ULO6:** Create, communicate and interpret the content of mathematical models relevant to foundation level science topics.

## General Assessment Information

**HURDLES:** Midterm test performance - A score of 40% or more on the test is required to pass the hurdle. A score between 30% and 40% entitles you to a resit of the test. If a resit is allowed, the required mark is still 40%, and the mark allocated to the assessment is capped at this mark. (So if a mark of 70% is achieved on the resit, a mark of 40% is awarded.)

Students are expected to participate in SGTA classes, either face-to-face or online, at the timetabled time of the class they have registered for. Additional details will be communicated on iLearn. As this is a hurdle requirement, students that are unable to participate in the SGTA class they have registered for must contact the Unit Convenor as a matter of priority.

**ASSIGNMENT SUBMISSION:** Assignment submission will be online through the iLearn page.

Submit assignments online via the appropriate assignment link on the iLearn page. A personalised cover sheet is not required with online submissions. Read the submission statement carefully before accepting it as there are substantial penalties for making a false declaration.

- Assignment submission is via iLearn. You should upload this as a single scanned PDF file.
- Please note the quick guide on how to upload your assignments provided on the iLearn page.
- Please make sure that each page in your uploaded assignment corresponds to only one A4 page (do not upload an A3 page worth of content as an A4 page in landscape). If you

are using an app like Clear Scanner, please make sure that the photos you are using are clear and shadow-free.

- It is your responsibility to make sure your assignment submission is legible.
- If there are technical obstructions to your submitting online, please email us to let us know.

You may submit as often as required prior to the due date/time. Please note that each submission will completely replace any previous submissions. It is in your interests to make frequent submissions of your partially completed work as insurance against technical or other problems near the submission deadline.

**LATE SUBMISSION OF WORK:** All assessment tasks must be submitted by the official due date and time. In the case of a late submission for a non-timed assessment (e.g. an assignment), if special consideration has NOT been granted, 20% of the earned mark will be deducted for each 24-hour period (or part thereof) that the submission is late for the first 2 days (including weekends and/or public holidays). For example, if an assignment is submitted 25 hours late, its mark will attract a penalty equal to 40% of the earned mark. After 2 days (including weekends and public holidays) a mark of 0% will be awarded. Timed assessment tasks (e.g. tests, examinations) do not fall under these rules.

**FINAL EXAM POLICY:** It is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period. The only excuse for not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these special circumstances, you may apply for special consideration via [ask.mq.edu.au](https://ask.mq.edu.au).

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during this supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application.

You can check the supplementary exam information page on FSE101 in iLearn ([bit.ly/FSESupp](https://bit.ly/FSESupp)) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

## Assessment Tasks

| Name   | Weighting | Hurdle | Due    |
|--|-----------|--------|--------|
| <a href="#"><u>Participation in SGTA classes</u></a> | 0%        | Yes    | Weekly |
| <a href="#"><u>Midterm Test</u></a>                  | 20%       | Yes    | Week 7 |

| Name                         | Weighting | Hurdle | Due                |
|------------------------------|-----------|--------|--------------------|
| <a href="#">Assignment 1</a> | 15%       | No     | Week 8             |
| <a href="#">Assignment 2</a> | 15%       | No     | Week 12            |
| <a href="#">Vodcast</a>      | 10%       | No     | Week 13            |
| <a href="#">Final Exam</a>   | 40%       | No     | Examination period |

## Participation in SGTA classes

Assessment Type [1](#): Participatory task

Indicative Time on Task [2](#): 0 hours

Due: **Weekly**

Weighting: **0%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

Students are expected to demonstrate their ability to engage with the unit by participating in SGTA classes.

On successful completion you will be able to:

- Demonstrate foundational learning skills including active engagement in the learning process.

## Midterm Test

Assessment Type [1](#): Quiz/Test

Indicative Time on Task [2](#): 1 hours

Due: **Week 7**

Weighting: **20%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

Set of questions with short answers required (using words, numerical analysis, graphs and formulas).

On successful completion you will be able to:

- Perform calculations, including rates of changes and integrals, of elementary functions used in science and economics (including linear, polynomial, exponential, logarithmic, and trigonometric) and interpret results of these calculations.
- Communicate mathematical concepts, pertaining to foundation level science topics, in a variety of forms including graphically, numerically, in writing and by using equations.

- Apply mathematical reasoning to simple problem solving in the context of elementary algebra and calculus.
- Test mathematical conjectures involving elementary functions.

## Assignment 1

Assessment Type <sup>1</sup>: Problem set

Indicative Time on Task <sup>2</sup>: 6 hours

Due: **Week 8**

Weighting: **15%**

Problems are chosen to explore concepts and techniques learned in the unit. Students will solve the problems using logical mathematical arguments and submit clearly written solutions.

On successful completion you will be able to:

- Perform calculations, including rates of changes and integrals, of elementary functions used in science and economics (including linear, polynomial, exponential, logarithmic, and trigonometric) and interpret results of these calculations.
- Communicate mathematical concepts, pertaining to foundation level science topics, in a variety of forms including graphically, numerically, in writing and by using equations.
- Apply mathematical reasoning to simple problem solving in the context of elementary algebra and calculus.
- Test mathematical conjectures involving elementary functions.
- Demonstrate foundational learning skills including active engagement in the learning process.
- Create, communicate and interpret the content of mathematical models relevant to foundation level science topics.

## Assignment 2

Assessment Type <sup>1</sup>: Problem set

Indicative Time on Task <sup>2</sup>: 6 hours

Due: **Week 12**

Weighting: **15%**

Problems are chosen to explore concepts and techniques learned in the unit. Students will solve the problems using logical mathematical arguments and submit clearly written solutions.

On successful completion you will be able to:

- Perform calculations, including rates of changes and integrals, of elementary functions used in science and economics (including linear, polynomial, exponential, logarithmic, and trigonometric) and interpret results of these calculations.

- Communicate mathematical concepts, pertaining to foundation level science topics, in a variety of forms including graphically, numerically, in writing and by using equations.
- Apply mathematical reasoning to simple problem solving in the context of elementary algebra and calculus.
- Test mathematical conjectures involving elementary functions.
- Demonstrate foundational learning skills including active engagement in the learning process.
- Create, communicate and interpret the content of mathematical models relevant to foundation level science topics.

## Vodcast

Assessment Type <sup>1</sup>: Media presentation

Indicative Time on Task <sup>2</sup>: 6 hours

Due: **Week 13**

Weighting: **10%**

A 3 to 5 minute vodcast, prepared in a group of 3-4 students, presenting a mathematical model utilizing content taught in the unit.

On successful completion you will be able to:

- Perform calculations, including rates of changes and integrals, of elementary functions used in science and economics (including linear, polynomial, exponential, logarithmic, and trigonometric) and interpret results of these calculations.
- Communicate mathematical concepts, pertaining to foundation level science topics, in a variety of forms including graphically, numerically, in writing and by using equations.
- Apply mathematical reasoning to simple problem solving in the context of elementary algebra and calculus.
- Test mathematical conjectures involving elementary functions.
- Demonstrate foundational learning skills including active engagement in the learning process.
- Create, communicate and interpret the content of mathematical models relevant to foundation level science topics.

## Final Exam

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 12 hours

Due: **Examination period**

Weighting: **40%**

This will be held during the final exam period. The students will be required to demonstrate understanding of concepts in calculus and algebra, implement mathematical techniques to solve problems in a wide variety of applications, and communicate mathematical ideas in writing.

On successful completion you will be able to:

- Perform calculations, including rates of changes and integrals, of elementary functions used in science and economics (including linear, polynomial, exponential, logarithmic, and trigonometric) and interpret results of these calculations.
- Communicate mathematical concepts, pertaining to foundation level science topics, in a variety of forms including graphically, numerically, in writing and by using equations.
- Apply mathematical reasoning to simple problem solving in the context of elementary algebra and calculus.
- Test mathematical conjectures involving elementary functions.

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<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

### Delivery

Four 1-hour lectures per week, provided online. (2 hours in the calculus stream, and 2 hours in the algebra stream). There are no repeat lectures.

One 1-hour Small Group Teaching Activity (SGTA) per week. SGTAs start in week 2.

### Resources

No single book covers the content of MATH1000 precisely. Each of the following books contains material useful and relevant to the unit.

Main textbook (highly recommended but not compulsory)

*Calculus - single & multivariable*, Hughes-Hallett, Gleason & McCallum (7th edition), John Wiley.

See <http://www.wileydirect.com.au/buy/calculus-single-multivariable-7th-edition/>

The [library](#) allow you to download a significant portion of the book. On the "advanced search" link for multisearch, put in the title "calculus" and the author "hughes-hallett", and it is the first result. (You will see "7 versions of this record exist.") Choosing the seventh edition takes you to where you can obtain online access, and download or view pdfs.



As indicated by the title, the text is predominantly calculus. However, Chapter 1 contains excellent material for the algebra part of the unit, covering exponentials, logarithms, trigonometry, and polynomials. Later sections in the text cover geometric series.

#### Recommended books

1. [Active Prelude to Calculus](#) by Boelkins. Extensive videos [here](#).
2. [Active Calculus](#) by Boelkins et al
3. [Modeling Life](#) by Garfinkel et al (free download from Macquarie University internet connection)
4. [MUMS modules](#). Material from the Numeracy Centre.
5. [Precalculus](#) by Stitz and Zeager. See 3rd corrected edition.
6. [Calculus](#) by Strang

## Unit Schedule

| Week | Algebra                      | Calculus  | Assessment Due |
|------|------------------------------|---|----------------|
| 1    | Notation, Modelling          | Lines   |                |
| 2    | Algebraic Techniques         | Functions   |                |
| 3    | Percentages, Proportionality | Introduction to the derivative                                |                |
| 4    | Quadratics                   | Derivative: meaning, definition, graphical interpretation     |                |
| 5    | Exponentials                 | Derivative: calculation, rules                                |                |
| 6    | Logarithms                   | Derivative: rules   |                |
| 7    | Trigonometry                 | Derivative: second derivative                                 | Midterm Test   |
| 8    | Trigonometry                 | Derivative: sketching, applications                           | Assignment 1   |
| 9    | Polynomials                  | Integration: accumulated change, summing                      |                |
| 10   | Polynomials                  | Integration: definition, signed area, numerical integration   |                |
| 11   | Inequalities                 | Integration: Fundamental theorem of calculus, antiderivatives |                |
| 12   | Sequences and Series         | Integration: antiderivatives, substitution                    | Assignment 2   |
| 13   | Revision                     | Revision  | Vodcast        |

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

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

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](https://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](https://mq.edu.au/learningskills)) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## 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)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](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.

## Changes since First Published

| Date       | Description  |
|------------|--|
| 23/07/2020 | Added in a sentence for Hurdle SGTA requirements to the General Assessment section |