



# MATH1010

## Calculus and Linear Algebra I

Session 2, Special circumstances 2021

*Archive (Pre-2022) - Department of Mathematics and Statistics*

### Contents

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<a href="#"><u>General Information</u></a>	2
<a href="#"><u>Learning Outcomes</u></a>	3
<a href="#"><u>General Assessment Information</u></a>	3
<a href="#"><u>Assessment Tasks</u></a>	5
<a href="#"><u>Delivery and Resources</u></a>	8
<a href="#"><u>Unit Schedule</u></a>	9
<a href="#"><u>Policies and Procedures</u></a>	9

#### **Disclaimer**

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#### **Session 2 Learning and Teaching Update**

The decision has been made to conduct study online for the remainder of Session 2 for all units WITHOUT mandatory on-campus learning activities. Exams for Session 2 will also be online where possible to do so.

This is due to the extension of the lockdown orders and to provide certainty around arrangements for the remainder of Session 2. We hope to return to campus beyond Session 2 as soon as it is safe and appropriate to do so.

Some classes/teaching activities cannot be moved online and must be taught on campus. You should already know if you are in one of these classes/teaching activities and your unit convenor will provide you with more information via iLearn. If you want to confirm, see the list of [units with mandatory on-campus classes/teaching activities](#).

Visit the [MQ COVID-19 information page](#) for more detail.

## General Information

Unit convenor and teaching staff

Unit Convenor/Lecturer

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Contact via Email

Please refer to iLearn

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Ross Moore

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Credit points

10

Prerequisites

(HSC Advanced Mathematics Band 4 and above or Extension 1 Band E2 and above or Extension 2) or MATH130 or MATH1000 or WFMA003 or WFMA0003 or WMAT123 or WMAT1000

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. This subject provides an introduction to basic concepts and techniques in linear algebra and calculus. In algebra, topics covered include matrices, systems of linear equations and their applications, including the use of vectors in two and three-dimensional Euclidean geometry and linear optimisation. In calculus, the concept of a function of one variable is explored, and the notions of limit and continuity are developed. The concept of the derivative as a suitable construct to describe rates of change is defined and techniques of differential and integral calculus of functions of a real variable are developed. Some simple differential equations and their role as quantitative models for dynamic processes, are discussed. Students are also introduced to the use of computers in mathematics, and develop modelling and problem solving skills through theoretical and practical problems.

## 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:** Determine solutions to linear systems of equations using matrix tools and techniques.
- ULO2:** Employ techniques from linear algebra to analyse structures in 2- and 3-D Euclidean space, including vectors, lines and planes.
- ULO3:** Analyze a mathematical problem using concepts of limits, continuity and differentiability.
- ULO4:** Utilise the techniques of differentiation and integration with proficiency to a wide range of functions.
- ULO5:** Evaluate problems from a wide variety of applications and utilise mathematical and computational techniques to solve them.

## General Assessment Information

**HURDLES:** Attendance at, and reasonable engagement in, Small Group Teaching Activities (SGTA) classes in all first year mathematics and statistics units is **compulsory**. Attendance and reasonable engagement in the class activities in at least 10 out of 12 of the SGTA classes are requirements to pass the unit. This is a hurdle requirement.

The Major Test 1 is also a hurdle. See the unit iLearn page for more detail.

**ATTENDANCE and PARTICIPATION:** Please contact the unit convenor as soon as possible if

you have difficulty attending and participating in any classes. There may be alternatives available to make up the work. If there are circumstances that mean you will miss a class, you can apply for Special Consideration via [ask.mq.edu.au](http://ask.mq.edu.au).

**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](http://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/FSESup](http://bit.ly/FSESup)) 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="#">SGTA Participation</a>	0%	Yes	Weekly
<a href="#">Major Test 1 (online)</a>	20%	Yes	Week 5
<a href="#">Major Test 2 (online)</a>	20%	No	Week 11
<a href="#">Matlab Assignment</a>	10%	No	Week 12
<a href="#">Final examination</a>	50%	No	Examination Period

### SGTA Participation

Assessment Type <sup>1</sup>: Participatory task

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

- Determine solutions to linear systems of equations using matrix tools and techniques.
- Employ techniques from linear algebra to analyse structures in 2- and 3-D Euclidean space, including vectors, lines and planes.
- Analyze a mathematical problem using concepts of limits, continuity and differentiability.
- Utilise the techniques of differentiation and integration with proficiency to a wide range of functions.

- Evaluate problems from a wide variety of applications and utilise mathematical and computational techniques to solve them.

## Major Test 1 (online)

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 7 hours

Due: **Week 5**

Weighting: **20%**

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

This will be an online test held during the semester. It will test the ability of students to analyse and solve mathematical problems using concepts and techniques in linear algebra and calculus.

On successful completion you will be able to:

- Determine solutions to linear systems of equations using matrix tools and techniques.
- Employ techniques from linear algebra to analyse structures in 2- and 3-D Euclidean space, including vectors, lines and planes.
- Analyze a mathematical problem using concepts of limits, continuity and differentiability.
- Utilise the techniques of differentiation and integration with proficiency to a wide range of functions.
- Evaluate problems from a wide variety of applications and utilise mathematical and computational techniques to solve them.

## Major Test 2 (online)

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 7 hours

Due: **Week 11**

Weighting: **20%**

This will be an online test held during the semester. It will test the ability of students to analyse and solve mathematical problems using concepts and techniques in linear algebra and calculus.

On successful completion you will be able to:

- Determine solutions to linear systems of equations using matrix tools and techniques.

- Employ techniques from linear algebra to analyse structures in 2- and 3-D Euclidean space, including vectors, lines and planes.
- Analyze a mathematical problem using concepts of limits, continuity and differentiability.
- Utilise the techniques of differentiation and integration with proficiency to a wide range of functions.
- Evaluate problems from a wide variety of applications and utilise mathematical and computational techniques to solve them.

## Matlab Assignment

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

Indicative Time on Task <sup>2</sup>: 7 hours

Due: **Week 12**

Weighting: **10%**

The problem set will be aimed at introducing Matlab as a mathematical tool. It will ask students to perform various tasks using Matlab, such as plotting functions, computing derivatives and integrals, performing Gaussian elimination, and solving linear optimisation problems.

On successful completion you will be able to:

- Determine solutions to linear systems of equations using matrix tools and techniques.
- Employ techniques from linear algebra to analyse structures in 2- and 3-D Euclidean space, including vectors, lines and planes.
- Analyze a mathematical problem using concepts of limits, continuity and differentiability.
- Utilise the techniques of differentiation and integration with proficiency to a wide range of functions.
- Evaluate problems from a wide variety of applications and utilise mathematical and computational techniques to solve them.

## Final examination

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

Indicative Time on Task <sup>2</sup>: 15 hours

Due: **Examination Period**

Weighting: **50%**

This will be an invigilated exam, held during the final exam period. It will test the ability of students to synthesise the concepts taught in the course in order to analyse and solve mathematical problems with various applications.

On successful completion you will be able to:

- Determine solutions to linear systems of equations using matrix tools and techniques.
  - Employ techniques from linear algebra to analyse structures in 2- and 3-D Euclidean space, including vectors, lines and planes.
  - Analyze a mathematical problem using concepts of limits, continuity and differentiability.
  - Utilise the techniques of differentiation and integration with proficiency to a wide range of functions.
  - Evaluate problems from a wide variety of applications and utilise mathematical and computational techniques to solve them.
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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

### Classes:

- Lectures: There are two one-hour lectures each week.
- SGTA classes: Students should attend one, one-hour class per week. Participation in these classes are a hurdle requirement

**Course Notes:** Student notes will be posted on iLearn.

### Suggested textbooks:

- Algebra - *Lay*, Linear Algebra and its Applications, 5th edition.
- Calculus - *Stewart*, Calculus (Metric Version), 8th edition.

### Other useful texts:

- Anton - Linear Algebra and its Applications
- Hughes-Hallett - Calculus: single and multivariable



## Unit Schedule

Wk	Wednesday Lecture	Friday Lecture	Assessment Due
	Sets and Vectors	Dot Product and Orthogonality	
	Matrix Operations	Linear Equations and Gauss-Jordan Elimination	
	Gauss-Jordan Elimination and Consistency	Homogeneous Equations	
	Determinants and Vector/Scalar Product	Equations of Lines	
	Equations of Planes	Functions and Trigonometry	Test 1
	Composite and Inverse Functions	Monotonicity and Exponential	
	Limits	One Sided and Infinite Limits	
	Continuity	Differentiation	
	Differentiation Rules	Extreme Values	
	Integration	Integral Properties	
	Fundamental Theorem of Calculus	Integration Techniques	Test 2
	Integration Techniques	Differential Equations	Assignment
	Review	Review	

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). 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](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/su\)](https://students.mq.edu.au/su)

[port/study/policies](#)). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central](#) (<https://policies.mq.edu.au>) and use the [search tool](#).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/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> 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>) 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>

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.