MATH1010
Calculus and Linear Algebra I
Session 2, In person-scheduled-weekday, North Ryde 2022
School of Mathematical and Physical Sciences

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## General Information

<table>
<thead>
<tr>
<th>Unit convenor and teaching staff</th>
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</thead>
<tbody>
<tr>
<td>Christopher Gordon</td>
</tr>
<tr>
<td><a href="mailto:chris.gordon@mq.edu.au">chris.gordon@mq.edu.au</a></td>
</tr>
<tr>
<td>Ross Moore</td>
</tr>
<tr>
<td><a href="mailto:ross.moore@mq.edu.au">ross.moore@mq.edu.au</a></td>
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| Credit points | 10 |

<table>
<thead>
<tr>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>(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</td>
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<table>
<thead>
<tr>
<th>Corequisites</th>
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<table>
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<tr>
<th>Co-badged status</th>
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<tbody>
<tr>
<td>MATH1010/S2/ONL-S-DAY MATH6904/S2/F2F-DAY MATH6904/S2/ONL-S-DAY</td>
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<table>
<thead>
<tr>
<th>Unit description</th>
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<tr>
<td>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.</td>
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## 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](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.

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.

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 ASSESSMENT SUBMISSION PENALTY — General Policy**

From 1 July 2022, Students enrolled in Session based units with written assessments will have the following university standard late penalty applied. Please see [https://students.mq.edu.au/study/assessment-exams/assessments](https://students.mq.edu.au/study/assessment-exams/assessments) for more information.

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at 11:55 pm. A 1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for [Special Consideration](https://students.mq.edu.au/study/assessment-exams/assessments).

**Assessments where Late Submissions will be accepted:**

In this unit, late submissions will be accepted as follows:

- **MatLab assessment:** Yes, Standard Late Penalty applies.

  If special consideration has NOT been granted, 5% of the total value will be deducted for each 24-hour period (or part thereof) that the submission is late for the first 7 days (including weekends and/or public holidays). For example, if an assignment is submitted 3 days late, its mark will attract a penalty equal to 15% of the total value. After 7 days (including weekends and public holidays) a mark of 0% will be awarded.

- **Timed assessment** tasks (e.g. online tests, quizzes, examinations): No, unless Special Consideration is granted.

  A generous window of times is assigned for tests and quizzes, usually covering up to 2 days. All attempts must be done within this window.

**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: [Special Consideration](https://students.mq.edu.au/study/assessment-exams/assessments).

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) 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

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
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</thead>
<tbody>
<tr>
<td>Matlab Assignment</td>
<td>10%</td>
<td>No</td>
<td>Week 12</td>
</tr>
<tr>
<td>Weekly Quiz</td>
<td>16%</td>
<td>No</td>
<td>Weekly</td>
</tr>
<tr>
<td>Major Test 2</td>
<td>12%</td>
<td>No</td>
<td>Week 11</td>
</tr>
<tr>
<td>Major Test 1</td>
<td>12%</td>
<td>No</td>
<td>Week 5</td>
</tr>
<tr>
<td>Final examination</td>
<td>50%</td>
<td>No</td>
<td>Examination Period</td>
</tr>
<tr>
<td>SGTA Participation</td>
<td>0%</td>
<td>Yes</td>
<td>Weekly</td>
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Matlab Assignment

Assessment Type 1: Problem set
Indicative Time on Task 2: 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.
Weekly Quiz

Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 9 hours
Due: Weekly
Weighting: 16%

The subject will have nine weekly online (iLearn) quizzes containing one to three short questions. The quizzes will last for one hour, and be available for a duration of one week. The quizzes will not run in Week 1, or weeks containing a midterm test. Each quiz is worth 2%, with the best eight quizzes counted to the overall grade.

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

Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 7 hours
Due: Week 11
Weighting: 12%

This 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 1
Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 7 hours
Due: Week 5
Weighting: 12%

This 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.

Final examination
Assessment Type 1: Examination
Indicative Time on Task 2: 15 hours
Due: Examination Period
Weighting: 50%

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.

SGTA Participation

Assessment Type: Participatory task
Indicative Time on Task: 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.

1 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.
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, two-hour class per week. *Participation in these classes are a hurdle requirement.*

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

**Suggested textbooks:**


**Other useful texts:**

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

**Unit Schedule**

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<tr>
<th>Wk</th>
<th>Wednesday Lecture</th>
<th>Friday Lecture</th>
<th>Assessment Due</th>
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<tbody>
<tr>
<td></td>
<td>Sets and Vectors</td>
<td>Dot Product and Orthogonality</td>
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<tr>
<td>2</td>
<td>Matrix Operations</td>
<td>Linear Equations and Gauss–Jordan Elimination</td>
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<td></td>
<td>Gauss–Jordan Elimination and Consistency</td>
<td>Homogeneous Equations</td>
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<td></td>
<td>Determinants and Vector/Scalar Product</td>
<td>Equations of Lines</td>
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<td></td>
<td>Equations of Planes</td>
<td>Functions and Trigonometry</td>
<td>Test 1</td>
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<td></td>
<td>Composite and Inverse Functions</td>
<td>Monotonicity and Exponential</td>
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<tr>
<td></td>
<td>Limits</td>
<td>One Sided and Infinite Limits</td>
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<tr>
<td></td>
<td>Continuity</td>
<td>Differentiation</td>
<td></td>
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<td></td>
<td>Differentiation Rules</td>
<td>Extreme Values</td>
<td></td>
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<tr>
<td></td>
<td>Integration</td>
<td>Integral Properties</td>
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Macquarie University policies and procedures are accessible from Policy Central (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
- Assessment Procedure
- Complaints Resolution 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/support/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

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a
range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

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

The Writing Centre
The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the 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
Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues

Student Enquiries
Got a question? Ask us via AskMQ, or contact Service Connect.

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.