MATH1015

Calculus and Linear Algebra I (Advanced)

Session 1, In person-scheduled-weekday, North Ryde 2025

School of Mathematical and Physical Sciences

Contents

General Information

Unit convenor and teaching staff
Unit Convener
Ji Li
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Contact via Email
710, 12WW
Wednesday and Friday 11:00am--12:00pm, 1:00pm--2:00pm,

Christian Thomas
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Credit points
10

Prerequisites
(HSC Mathematics Extension 1 Band E3 and above or HSC Mathematics Extension 2) or admission to BActStud or BActStudProfPrac(Hons)

Corequisites

Co-badged status

Unit description
This is the first mainstream university mathematics unit and is presented at a more advanced level than MATH1010. The material covered is essential for students studying mathematical or actuarial sciences. 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 the context of a mathematical statement in order to determine the validity of a given argument, and to construct mathematical proofs.

General Assessment Information

General Assessment Information

Requirements to Pass this Unit

To pass this unit you must:

- Achieve a total mark equal to or greater than 50%.

Attendance and participation

We strongly encourage all students to actively participate in all learning activities. Regular engagement is crucial for your success in this unit, as these activities provide opportunities to deepen your understanding of the material, collaborate with peers, and receive valuable feedback from instructors, to assist in completing the unit assessments. Your active participation not only enhances your own learning experience but also contributes to a vibrant and dynamic learning environment for everyone.

Late Assessment Submission Penalty

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation 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. The submission time for all uploaded assessments is 11:55 pm. A 1-hour grace period will be provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, assign- ments, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for Special Consideration: https://connect.mq.edu.au

Assessments where Late Submissions will be accepted:

• Assignment – YES, Standard Late Penalty applies

Special Consideration

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through https://connect.mq.edu.au.

Written Assessments/Quizzes/Tests: If you experience circumstances or events that affect your ability to complete the written assessments in this unit on time, please inform the con- venor and submit a Special Consideration request through https://connect.mq.edu.au.

Assessment Tasks

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
Final examination	50%	No	Exam Period		No	
Assignment	20%	No	11:59pm, 30th May 2025 (Friday Week 12)		No	
Skills exercise	30%	No	11.55pm 6th June 2025 (weekly formative feedback provided)		No	

Final examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 20 hours
Due: **Exam Period**
Weighting: **50%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

The exam will test the ability of students to utilise concepts and techniques learnt in the unit.

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 the context of a mathematical statement in order to determine the validity of a given argument, and to construct mathematical proofs.

Assignment

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 12 hours
Due: **11:59pm, 30th May 2025 (Friday Week 12)**
Weighting: **20%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

The assignment will test the ability of students to solve mathematical problems using concepts and techniques learnt in the unit.

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.
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Skills exercise

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 18 hours
Due: **11.55pm 6th June 2025 (weekly formative feedback provided)**
Weighting: **30%**
Groupwork/Individual:
Short extension [3]: No

AI Approach:

Exercises designed to develop and assess mathematical skills, reinforcing theoretical knowledge through consistent practice to promote mastery of essential concepts.

On successful completion you will be able to:

- Determine solutions to linear systems of equations using matrix tools and techniques.
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[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
- Academic Success for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation.

[3] An automatic short extension is available for some assessments. Apply through the Service Connect Portal.

Delivery and Resources

Delivery and Resources

Classes:

- Lectures (beginning in Week 1): There are two one-hour lectures each week.
- SGTA classes (beginning in Week 2): Students must register in and attend one one-hour class per week.

Course Notes: Student notes will be posted on iLearn.

Suggested textbooks:

The following textbooks are useful as supplementary resources, for additional questions and

explanations. They are available from the Macquarie University library:

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

Communication

We will communicate with you via your university email or through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or emailed to your lecturers from your university email address. Please include the unit code (MATH1015) in the subject line of your email.

Unit Schedule

Planned Unit Schedule

Week	Lecture 1	Lecture 2
1	Functions and limit	Continuity
2	Derivatives and Implicit Differentiation	Mean value theorem
3	Antiderivatives	Indefinite Integration
4	Definite Integration	Fundamental Theorem of Calculus
5	Substitution & Integration by Parts	Differential Equations
6	First-Order Differential Equations	Second-Order Differential Equations
7	Sets & Vectors	Linear Systems
8	Matrices	Vector Spaces
9	Gaussian Elimination	Gaussian Elimination
10	Norms & Orthogonality	Determinants
11	Determinant Properties	Projection and Cross Products
12	Lines and Places	Lines and Places
13	Revision (Linear Algebra)	Revision (Calculus)

Policies and Procedures

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 connect.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/

Academic Success

Academic Success 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 Advocacy provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via the Service Connect Portal, 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.

Changes from Previous Offering

To enable students more time to focus on learning, understanding and reflecting on the content of our unit we have revised the assessment structure as follows. There are now only three assessments: a skills assessment, assignment and final exam. Although no marks are associated with attendance, all activities provide you with key content designed to help you understand content and complete the assessments.

Unit information based on version 2025.05 of the Handbook