MATH1020

Calculus and Linear Algebra II

Session 1, Online-scheduled-In person assessment 2025

School of Mathematical and Physical Sciences

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General Information

Unit convenor and teaching staff
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Credit points
10

Prerequisites
MATH1010 or MATH1015

Corequisites

Co-badged status

Unit description
The foundations of linear algebra and calculus introduced in MATH1010 are further explored and extended. Topics covered in algebra include: inverse matrices, determinants, vector spaces & subspaces, eigenvalues and eigenvectors and linear transformations. In calculus the topics include: the further development of the concepts of limits, continuity and the derivative, numerical integration, polynomials, sequences & series and differential equations. In addition, complex numbers and the calculus of two or more variables are introduced. Students utilise mathematical software throughout the course to support and enhance problem solving for a variety of 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: Apply matrix inversion and decomposition methods to determine solutions to systems of linear equations.
ULO2: Analyse vectors and linear maps in spaces of arbitrary dimension, developing concepts such as vector spaces and eigenspaces.
ULO3: Utilise complex numbers and techniques of differentiation and integration to determine and compare properties of single variable and multivariable functions.
ULO4: Analyse the convergence of a wide range of infinite series, including Taylor series.
ULO5: Evaluate problems from a wide variety of applications and apply appropriate algorithmic techniques to obtain solutions.

General Assessment Information

Requirements to Pass this Unit

Achieve a total mark equal to or greater than 50% across all assessments.

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, assignments, 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:

- Problems set, skills assessment – 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.

Assessment Tasks

Name	Weighting	Hurdle	Due
Skills exercise	30%	No	06/06/2025
Assignment	20%	No	01/06/2025
Final examination	50%	No	Exam period

Skills exercise

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 18 hours
Due: **06/06/2025**
Weighting: **30%**

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:

- Apply matrix inversion and decomposition methods to determine solutions to systems of linear equations.
- Analyse vectors and linear maps in spaces of arbitrary dimension, developing concepts such as vector spaces and eigenspaces.
- Utilise complex numbers and techniques of differentiation and integration to determine and compare properties of single variable and multivariable functions.
- Analyse the convergence of a wide range of infinite series, including Taylor series.
- Evaluate problems from a wide variety of applications and apply appropriate algorithmic techniques to obtain solutions.

Assignment

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 12 hours
Due: **01/06/2025**
Weighting: **20%**

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:

- Apply matrix inversion and decomposition methods to determine solutions to systems of linear equations.
- Analyse vectors and linear maps in spaces of arbitrary dimension, developing concepts such as vector spaces and eigenspaces.
- Utilise complex numbers and techniques of differentiation and integration to determine and compare properties of single variable and multivariable functions.
- Analyse the convergence of a wide range of infinite series, including Taylor series.
- Evaluate problems from a wide variety of applications and apply appropriate algorithmic techniques to obtain solutions.

Final examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 20 hours
Due: **Exam period**
Weighting: **50%**

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:

- Apply matrix inversion and decomposition methods to determine solutions to systems of linear equations.
- Analyse vectors and linear maps in spaces of arbitrary dimension, developing concepts such as vector spaces and eigenspaces.
- Utilise complex numbers and techniques of differentiation and integration to determine and compare properties of single variable and multivariable functions.
- Analyse the convergence of a wide range of infinite series, including Taylor series.
- Evaluate problems from a wide variety of applications and apply appropriate algorithmic techniques to obtain solutions.

[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.

[2] 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 (beginning in Week 1): There are two one-hour lectures each week.

• SGTA classes (beginning in Week 2): There is one two-hour sgta each week.

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.
- Calculus - *Stewart*, Calculus (Metric Version).

Methods of 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 sent to your lecturers from your university email address.

Unit Schedule

Unit Schedule

Week	
	Stream 1 – Algebra
1	Matrices (Review), Vectors, Linear Combinations, Elementary Matrices
2	Inverse Matrices, Matrices, LU Decomposition, Determinants
3	Linear Dependence, Vector Spaces & Subspaces, Bases
4	Dimension, Eigenvalues & Eigenvectors, Eigenspaces
5	Diagonalisation, Linear Transformations

6	Matrix of a Linear Transformations, Composition of Linear Transformations
	Stream 2 – Calculus
7	Limits, Improper Integrals, Continuity
8	IVT, Newton's Method, Rolle's Theorem, MVT, Numerical Integration, Complex Numbers
9	Argand Plane, Polar Form, De Moivre's Theorem, Polynomials
10	Polynomials, Taylor Polynomials, Infinite Series
11	Functions of Several Variables, Partial Derivatives
12	Directional Derivatives, Extrema, 2nd order ODEs, Systems of ODEs

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/

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 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

There are now only three assessments: a skills assessment, report and final exam.

Unit information based on version 2025.05 of the Handbook