



MATH1020

Calculus and Linear Algebra II

Session 1, Special circumstances 2021

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

Contents

General Information	2
Learning Outcomes	3
General Assessment Information	3
Assessment Tasks	4
Delivery and Resources	8
Unit Schedule	8
Policies and Procedures	9
Changes since First Published	10

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 activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face 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

Convenor/Lecturer

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Please refer to iLearn

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Credit points

10

Prerequisites

MATH1010 or MATH1015 or MATH132 or MATH135

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

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.

Major Test 1 is also a hurdle. Details available on iLearn.

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 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 (for example, 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 (for example, tests and 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.

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

Name	Weighting	Hurdle	Due
<u>SGTA Participation</u>	0%	Yes	Weekly (from Week 2)

Name	Weighting	Hurdle	Due
Major Test 1 (online)	20%	Yes	Week 5
Major Test 2 (online)	20%	No	Week 11
Matlab Assignment	10%	No	Week 12
Final examination	50%	No	University Examination Period

SGTA Participation

Assessment Type ¹: Participatory task

Indicative Time on Task ²: 0 hours

Due: **Weekly (from Week 2)**

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:

- 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.

Major Test 1 (online)

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 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:

- 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.

Major Test 2 (online)

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 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:

- 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.

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 further developing the ability to use Matlab to solve mathematical problems and perform mathematical operations. It will ask students to use Matlab to perform tasks such as solving linear systems, perform linear transformations, determine the values of series and integrals, and plot functions of more than one variable.

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: 15 hours

Due: **University 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:

- 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: There are 2 one-hr online lectures each week and 1 SGTA class each week. Students are strongly encouraged to attend both lectures each week.

SGTA: You should attend and participate in one Small Group Teaching Activity (SGTA) each week, from Week 2. Students must participate in the SGTA in which they are enrolled. Any variation to this has to be approved by the convenor. **This is a hurdle requirement.**

This unit will use: iLearn; students need regular access to a reliable internet connection. MATLAB; students need regular access to the computer program MATLAB (available for download onto personally owned devices, and on computers around campus).

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

Unit Schedule

Algebra: Matrices (Review), Vectors, Linear Combinations, Elementary Matrices, Inverse Matrices, Matrices, LU Decomposition, Determinants, Adjugates, Linear Dependence, Vector Spaces & Subspaces, Bases & Dimension, Eigenvalues & Eigenvectors, Eigenspaces & Diagonalisation, Powers of Matrices, Linear Transformations, Matrix of a Linear Transformations, Composition of Linear Transformations.

Calculus: Limits, Improper Integrals, Indeterminate Forms, Continuity, IVT, Newton's Method, Rolle's Theorem, MVT, Numerical Integration, Complex Numbers, Argand Plane, Polar Form, De Moivre's Theorem, Polynomials, Taylor Polynomials, Infinite Series, Functions of Several Variables, Partial Derivatives, 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) (<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/support/study/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) (<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

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

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 since First Published

Date	Description
11/02/2021	Updates to the following sections: Assessment, Delivery Resources Staff