General Information

Unit convenor and teaching staff
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Credit points
10

Prerequisites
MATH1010(HD) or MATH1015 or MATH135(HD) or MATH132

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 elementary numerical techniques for root finding, function approximation and integration, in order to assess the convergence criteria or the error estimate of the method.

### General Assessment Information

**Hurdles:** there are no hurdles for this unit.

**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:** 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**.

**Assessments where Late Submissions will be accepted:** In this unit, late submissions will accepted as follows:

- Assignment – YES, Standard Late Penalty applies
- Major Tests 1 and 2 - NO, unless Special Consideration is Granted
- Weekly Quizzes - NO, unless Special Consideration is Granted

**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

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Test 2</td>
<td>12%</td>
<td>No</td>
<td>Week 11</td>
</tr>
<tr>
<td>SGTA Participation</td>
<td>0%</td>
<td>Yes</td>
<td>Weeks 2 to 13</td>
</tr>
<tr>
<td>Weekly Quiz</td>
<td>16%</td>
<td>No</td>
<td>Weeks 2 to 12</td>
</tr>
<tr>
<td>Major Test 1</td>
<td>12%</td>
<td>No</td>
<td>Week 5</td>
</tr>
<tr>
<td>Assignment</td>
<td>10%</td>
<td>No</td>
<td>Week 12</td>
</tr>
<tr>
<td>Final Examination</td>
<td>50%</td>
<td>No</td>
<td>Exam period</td>
</tr>
</tbody>
</table>
Major Test 2
Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 7 hours
Due: **Week 11**
Weighting: **12%**

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 elementary numerical techniques for root finding, function approximation and integration, in order to assess the convergence criteria or the error estimate of the method.

SGTA Participation
Assessment Type 1: Participatory task
Indicative Time on Task 2: 0 hours
Due: **Weeks 2 to 13**
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 elementary numerical techniques for root finding, function approximation and integration, in order to assess the convergence criteria or the error estimate of the method.

Weekly Quiz

Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 9 hours
Due: Weeks 2 to 12
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:
- 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 elementary numerical techniques for root finding, function approximation and integration, in order to assess the convergence criteria or the error estimate of the method.

Major Test 1

Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 7 hours
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.
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Assignment
Assessment Type: Problem set
Indicative Time on Task: 7 hours
Due: Week 12
Weighting: 10%

This assignment will test the ability of students to solve theoretical mathematical problems using concepts and techniques from linear algebra and calculus, and prove mathematical statements.

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 elementary numerical techniques for root finding, function approximation and integration, in order to assess the convergence criteria or the error estimate of the method.

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

This will be 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 elementary numerical techniques for root finding, function approximation and integration, in order to assess the convergence criteria or the error estimate of the method.

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: there are two one-hour lectures each week
- SGTA classes: there is one one-hour SGTA class each week

Unit Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Limits, improper integrals, indeterminate forms, continuity</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Intermediate value theorem, Newton's Method, Rolle's Theorem, Mean Value Theorem, numerical integration, complex numbers</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Argand plane, polar form, De Moivre's Theorem, polynomials</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Polynomials, Taylor polynomials, infinite series</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Functions of several variables, partial derivatives</td>
<td>Test 1</td>
</tr>
<tr>
<td>6</td>
<td>Directional derivatives, extrema, second order ODEs, systems of ODEs</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Vectors, linear combinations, elementary matrices</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Inverse matrices, LU decomposition, determinants</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Determinants, adjugates, linear dependence, vector spaces and subspaces</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Bases and dimension, eigenvalues and eigenvectors</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Eigenspaces and diagonalisation, powers of matrices, linear transformations</td>
<td>Test 2</td>
</tr>
<tr>
<td>12</td>
<td>Matrix of a linear transformation, composition of linear transformations</td>
<td>Assignment</td>
</tr>
</tbody>
</table>

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
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.