MATH7905
Research Topics in Mathematics 2
Session 2, Special circumstances 2021
Department of Mathematics and Statistics

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Session 2 Learning and Teaching Update
The decision has been made to conduct study online for the remainder of Session 2 for all units WITHOUT mandatory on-campus learning activities. Exams for Session 2 will also be online where possible to do so.

This is due to the extension of the lockdown orders and to provide certainty around arrangements for the remainder of Session 2. We hope to return to campus beyond Session 2 as soon as it is safe and appropriate to do so.

Some classes/teaching activities cannot be moved online and must be taught on campus. You should already know if you are in one of these classes/teaching activities and your unit convenor will provide you with more information via iLearn. If you want to confirm, see the list of units with mandatory on-campus classes/teaching activities.

Visit the MQ COVID-19 information page for more detail.

https://unitguides.mq.edu.au/unit_offerings/133362/unit_guide/print
General Information

Unit convenor and teaching staff
Lecturer
Christopher Lustri
christopher.lustri@mq.edu.au
Contact via Email
Weekly; refer to iLearn for times.

Credit points
10

Prerequisites
Admission to MRes

Corequisites

Co-badged status

Unit description
This unit is based on an area of current mathematical research. The specific area may vary from year to year depending on the interests of the students and lecturer.

Important Academic Dates
Information about important academic dates including deadlines for withdrawing from units are available at https://students.mq.edu.au/important-dates

Learning Outcomes
On successful completion of this unit, you will be able to:

  **ULO1**: Demonstrate advanced disciplinary knowledge and skills in a particular area of mathematics.

  **ULO2**: Apply advanced mathematical skills to related areas of mathematics or other disciplines.

  **ULO3**: Use abstract mathematical frameworks to synthesize diverse examples or phenomena from within a particular area of mathematics.

  **ULO4**: Communicate effectively the results of advanced mathematical reasoning.

General Assessment Information

**HURDLES**: This unit has no hurdle requirements.
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.
- 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: All assignments must be submitted by the official due date and time. No marks will be given for late work unless an extension has been granted following a successful application for Special Consideration. Please contact one of the unit convenors for advice as soon as you become aware that you may have difficulty meeting any of the assignment deadlines. It is in your interests to make frequent submissions of your partially completed work. Note that later submissions completely replace any earlier submission, and so only the final submission made before the due date will be marked.

FINAL EXAM POLICY: This unit has no final exam.

### Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1</td>
<td>25%</td>
<td>No</td>
<td>Week 3</td>
</tr>
<tr>
<td>Assignment 3</td>
<td>25%</td>
<td>No</td>
<td>Week 6</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>25%</td>
<td>No</td>
<td>Week 9</td>
</tr>
<tr>
<td>Assignment 4</td>
<td>25%</td>
<td>No</td>
<td>Week 12</td>
</tr>
</tbody>
</table>
Assignment 1

Assessment Type: Problem set  
Indicative Time on Task: 10 hours  
Due: Week 3  
Weighting: 25%

The assignments reinforce and build on material from lectures, as well as leading students towards more advanced topics. They are designed to promote a more independent style of learning than in standard undergraduate units.

On successful completion you will be able to:

• Demonstrate advanced disciplinary knowledge and skills in a particular area of mathematics.
• Apply advanced mathematical skills to related areas of mathematics or other disciplines.
• Use abstract mathematical frameworks to synthesize diverse examples or phenomena from within a particular area of mathematics.
• Communicate effectively the results of advanced mathematical reasoning.

Assignment 3

Assessment Type: Problem set  
Indicative Time on Task: 10 hours  
Due: Week 6  
Weighting: 25%

The assignments reinforce and build on material from lectures, as well as leading students towards more advanced topics. They are designed to promote a more independent style of learning than in standard undergraduate units.

On successful completion you will be able to:

• Demonstrate advanced disciplinary knowledge and skills in a particular area of mathematics.
• Apply advanced mathematical skills to related areas of mathematics or other disciplines.
• Use abstract mathematical frameworks to synthesize diverse examples or phenomena from within a particular area of mathematics.
• Communicate effectively the results of advanced mathematical reasoning.

Assignment 2
Assessment Type: Problem set
Indicative Time on Task: 10 hours
Due: Week 9
Weighting: 25%

The assignments reinforce and build on material from lectures, as well as leading students towards more advanced topics. They are designed to promote a more independent style of learning than in standard undergraduate units.

On successful completion you will be able to:
• Demonstrate advanced disciplinary knowledge and skills in a particular area of mathematics.
• Apply advanced mathematical skills to related areas of mathematics or other disciplines.
• Use abstract mathematical frameworks to synthesize diverse examples or phenomena from within a particular area of mathematics.
• Communicate effectively the results of advanced mathematical reasoning.

Assignment 4
Assessment Type: Problem set
Indicative Time on Task: 10 hours
Due: Week 12
Weighting: 25%

The assignments reinforce and build on material from lectures, as well as leading students towards more advanced topics. They are designed to promote a more independent style of learning than in standard undergraduate units.

On successful completion you will be able to:
• Demonstrate advanced disciplinary knowledge and skills in a particular area of mathematics.
• Apply advanced mathematical skills to related areas of mathematics or other disciplines.
• Use abstract mathematical frameworks to synthesize diverse examples or phenomena.
from within a particular area of mathematics.

- Communicate effectively the results of advanced mathematical reasoning.

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 Learning Skills Unit 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**

There will be 1 x 2 hour live interactive learning activity each week.

Resources and relevant textbooks will be provided through iLearn.

**Unit Schedule**

Planned Unit Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Algebraic equations; Singular perturbations.</td>
</tr>
<tr>
<td>2</td>
<td>Rescaling &amp; dominant balance; Asymptotic approximations.</td>
</tr>
<tr>
<td>3</td>
<td>Integration by parts.</td>
</tr>
<tr>
<td>4</td>
<td>Watson's lemma; Laplace's method</td>
</tr>
<tr>
<td>5</td>
<td>Stationary phase.</td>
</tr>
<tr>
<td>6</td>
<td>Steepest descent (Part 1).</td>
</tr>
<tr>
<td>7</td>
<td>Steepest descent (Part 2).</td>
</tr>
<tr>
<td>8</td>
<td>WKB analysis.</td>
</tr>
<tr>
<td>9</td>
<td>Stokes' Phenomenon.</td>
</tr>
<tr>
<td>10</td>
<td>Optimal Truncation and Hyperasymptotics.</td>
</tr>
<tr>
<td>11</td>
<td>Resurgence and Hyperterminants</td>
</tr>
<tr>
<td>12</td>
<td>Saddle point analysis.</td>
</tr>
</tbody>
</table>

**Policies and Procedures**

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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 (Note: The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)

Students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

**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 Enquiry Service
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

Equity 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.

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.