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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.
General Information

Unit convenor and teaching staff

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Contact via elena.vynogradova@mq.edu.au
E7A
Friday or by appointment

Student Support Officer
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E7A
All week days from 10:00 to 17:00

Lecturer
Vladimir Gaitsgory
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E7A
Wednesday or by appointment

Credit points
3

Prerequisites
MATH133 or MATH136

Corequisites

Co-badged status

Unit description
The idea of a vector space first introduced in MATH136 and MATH133 is enriched in this unit by the introduction of an inner product. This leads to the important notion of orthogonality that underpins many areas of mathematics. The idea of linear transformations which transfer linearity from one space to another is also discussed. The results and techniques are then applied to problems such as approximation, quadratic forms and Fourier series. Differential and integral calculus involving functions of several real variables are discussed in greater depth than in MATH136 and MATH133. The ideas here are central to the development of mathematics in many different directions.
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:

- Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
- Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.
- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Expressing yourself clearly and logically in writing.

General Assessment Information

Please note the University's Final Examination policy states:

Each student will be responsible for:

- checking the final examination timetable
- adhering to the final examination timetable
- ensuring they are available for the full duration of the final examination period.

The mathematics department cannot reschedule the final examination date to suit the travel and holiday arrangements of students.

HURDLES: This unit has no hurdle requirements. This means that there are no second chance examinations and assessments if you happen to fail at your first attempt. Students should aim to get at least 60% for the course work in order to be reasonably confident of passing the unit.

IMPORTANT: If you apply for Disruption to Study for your final examination, you must make yourself available for the week of July 24 – 28, 2017. If you are not available at that time, there is no guarantee an additional examination time will be offered. Specific examination dates and times will be determined at a later date.

Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Assignments</td>
<td>30%</td>
<td>No</td>
<td>See the iLearn for details</td>
</tr>
<tr>
<td>Name</td>
<td>Weighting</td>
<td>Hurdle</td>
<td>Due</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------</td>
<td>--------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Exam</td>
<td>40%</td>
<td>No</td>
<td>Examination period</td>
</tr>
<tr>
<td>One Test</td>
<td>15%</td>
<td>No</td>
<td>Week 9</td>
</tr>
<tr>
<td>Tutorial participation</td>
<td>15%</td>
<td>No</td>
<td>Weekly</td>
</tr>
</tbody>
</table>

### 3 Assignments

**Due:** See the iLearn for details  
**Weighting:** 30%

Assignments on Algebra and Calculus.

On successful completion you will be able to:
- Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
- Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.
- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Expressing yourself clearly and logically in writing.

### Exam

**Due:** Examination period  
**Weighting:** 40%

Final exam

On successful completion you will be able to:
- Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
- Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.
- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Expressing yourself clearly and logically in writing.

### One Test

**Due:** Week 9
Weighting: 15%
Supervised in class test.

On successful completion you will be able to:

• Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
• Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.
• Understanding logical arguments and recognising any gaps or faults in such arguments.
• Expressing yourself clearly and logically in writing.

Tutorial participation

Due: Weekly
Weighting: 15%

Recorded tutorial attendance and marked post-tutorial questions. Only students who attend the whole tutorial session can submit post-tutorial work and receive marks for tutorial participation.

On successful completion you will be able to:

• Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
• Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.
• Understanding logical arguments and recognising any gaps or faults in such arguments.
• Expressing yourself clearly and logically in writing.

Delivery and Resources

The required texts for MATH235 for this session are


They are available from the CO-OP Bookshop on campus, among other places.

Digital versions can be obtained from the publisher; see here.

Unit Schedule
See on iLearn a weekly schedule of topics to be covered in the unit.

Learning and Teaching Activities

Lectures
4 one hour lectures per week

Tutorials
1 one hour tutorial per week

Policies and Procedures
Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

In addition, a number of other policies can be found in the Learning and Teaching Category of 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/support/student_conduct/

Results
Results shown in iLearn, 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.

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 improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

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

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.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
- Understanding logical arguments and recognising any gaps or faults in such arguments.

Assessment tasks

- 3 Assignments
- Exam
- One Test
Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

**Learning outcome**

- Understanding logical arguments and recognising any gaps or faults in such arguments.

**Assessment tasks**

- 3 Assignments
- Exam
- One Test
- Tutorial participation

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

**Learning outcomes**

- Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
- Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.

**Assessment tasks**

- 3 Assignments
- Exam
- One Test
Learning and teaching activities

- 4 one hour lectures per week
- 1 one hour tutorial per week

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
- Apply the learnt principles, concepts and techniques efficiently to solve practical and abstract problems across a range of areas in algebra, analysis and applied mathematics.
- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Expressing yourself clearly and logically in writing.

Assessment tasks

- 3 Assignments
- Exam
- One Test
- Tutorial participation

Learning and teaching activities

- 4 one hour lectures per week
- 1 one hour tutorial per week

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:
Learning outcomes

• Demonstrate a well-developed knowledge of differential and integral calculus of functions of several real variables, real inner product vector spaces, complex vector spaces, concepts of orthogonality, linear transformations.
• Understanding logical arguments and recognising any gaps or faults in such arguments.

Assessment tasks

• 3 Assignments
• Exam
• One Test
• Tutorial participation

Learning and teaching activities

• 4 one hour lectures per week
• 1 one hour tutorial per week

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

• Understanding logical arguments and recognising any gaps or faults in such arguments.
• Expressing yourself clearly and logically in writing.

Assessment tasks

• 3 Assignments
• Exam
• One Test
• Tutorial participation

Learning and teaching activities

• 1 one hour tutorial per week
## Changes since First Published

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/03/2017</td>
<td>The textbook is updated to the currently available edition</td>
</tr>
<tr>
<td>10/02/2017</td>
<td>Adjusted the assessment allocation.</td>
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