

MA270-10 Analysis 3

24/25

Department

Warwick Mathematics Institute

Level

Undergraduate Level 2

Module leader

Jose Rodrigo

Credit value

10

Module duration

10 weeks

Assessment

Multiple

Study location

University of Warwick main campus, Coventry

Description

Introductory description

This is the third module in the series Analysis 1, 2, 3 that covers rigorous Analysis. It covers convergence of functions and its applications to Integration, an introduction to multivariable calculus and Complex Analysis.

[Module web page](#)

Module aims

1. Continuity, differentiability and integral of the limit of a uniformly convergent sequence of functions.
2. An introduction to Multivariable calculus.
3. Foundations of Complex Analysis.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

- Uniform convergence of sequences and series of functions; Weierstrass M-test

- Application to integration: integrals of limits and series, differentiation under the integral sign
- Continuity in several variables
- Partial derivatives and differentiability in several variables
- Complex power series and classical functions (exponential, logarithm, sine and cosine, including periodicity)
- Complex integration, contour integrals and Cauchy's Theorem
- Applications of Cauchy's formula to evaluate real integrals
- Laurent series, Calculus of residues
- Sequences and Series of Functions
 - Pointwise and uniform convergence
 - Series of functions
 - A continuous, nowhere differentiable function
 - Space filling curves
 - Absolute Continuity
- Complex Analysis
 - Review of basic facts about \mathbb{C}
 - Power Series
 - The exponential and the circular functions
 - Argument and Log
 - Complex integration, contour integrals
 - Links with MA259
 - Consequences of Cauchy's Theorem
 - Applications of Cauchy's formula to evaluate integrals in \mathbb{R}

Learning outcomes

By the end of the module, students should be able to:

- Understand uniform and pointwise convergence of functions together with properties of the limit function
- Learn the continuity, differentiability and integral of the limit of a uniformly convergent sequence of functions
- Develop working knowledge of complex differentiability (Cauchy-Riemann equations) and complex power series
- Learn how to compute contour integrals: Cauchy's integral formulas and applications
- Understand derivatives of functions in several variables as linear maps

Indicative reading list

- Lecture notes will be provided for the module.
- The module webpage contains additional references that students may consult. Students registered for this module may access the relevant chapters of books scanned under copyright.

Subject specific skills

- Working knowledge of series and sequences, including the development of the notions of convergence and uniform convergence for sequences and series of functions.
- Working understanding of the notion of differentiability in higher dimensions
- Working knowledge of Complex Analysis, including power series, exponential and circular maps, contour integration.
- Mastery of applications of Cauchy's formula to compute integrals in \mathbb{R}

Transferable skills

- The students will be able to apply abstract notions in a variety of different contexts.
 - Use a variety of techniques to compute complicated integrals or asymptotic expansions for functions/quantities arising from a wide range of applications in the physical sciences.
 - Students will develop an ability to analyse and process complex information, triaging key concepts and effectively prepare plans for solving problems.
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Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (30%)
Seminars	9 sessions of 1 hour (9%)
Private study	61 hours (61%)
Total	100 hours

Private study description

61 hours private study, revision for exams, and assignments

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group D1

	Weighting	Study time	Eligible for self-certification
Assignments	15%		No

	Weighting	Study time	Eligible for self-certification
Examination	85%		No

- Answerbook Pink (12 page)

Assessment group R1

	Weighting	Study time	Eligible for self-certification
In-person Examination - Resit	100%		No

- Answerbook Pink (12 page)

Feedback on assessment

Marked assignments and exam feedback.

[Past exam papers for MA270](#)

Availability

Courses

This module is Core for:

- Year 2 of UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
- Year 2 of UMAA-G100 Undergraduate Mathematics (BSc)
- UMAA-G103 Undergraduate Mathematics (MMath)
 - Year 2 of G100 Mathematics
 - Year 2 of G103 Mathematics (MMath)
- Year 2 of UMAA-G1NC Undergraduate Mathematics and Business Studies
- Year 2 of UMAA-G1N2 Undergraduate Mathematics and Business Studies (with Intercalated Year)
- Year 2 of UMAA-GL11 Undergraduate Mathematics and Economics
- Year 2 of UECA-GL12 Undergraduate Mathematics and Economics (with Intercalated Year)
- Year 2 of UMAA-G101 Undergraduate Mathematics with Intercalated Year