

On-line course materials

MATH20111 - Real Analysis

Year: 2 - Semester: 1 - Credit Rating: 10

Requisites

Prerequisites

MATH10111 Sets, Numbers and Functions B

MATH10131 Calculus and Vectors B

Aims

The course unit aims to introduce the basic concepts of limit and convergence (of real sequences, series and functions) and to indicate how these are treated rigorously, and then show how these ideas are used in the development of real analysis.

Brief Description

The first part of the course discusses the convergence of real sequences and series.

The second part of the course discusses the concept of limit for real-valued functions of a real variable. This concept is then used to define and investigate the concepts of continuity and differentiability for such functions.

Learning Outcomes

On completion of this unit successful students will be able to:

- evaluate the limits of a wide class of real sequences;
- determine whether or not real series are convergent by comparison with standard series or using the Ratio Test;
- understand the concept of continuity and be familiar with the statements and some proofs of the standard results about continuous real functions;
- understand the concept of the differentiability of a real valued function and be familiar with the statements of the standard results about differentiable real functions.

Syllabus

- **Sequences.** Null sequences and the standard list of null sequences. Convergent sequences, the Algebra of Limits, divergent sequences, monotone bounded sequences
- **Series.** Convergent and divergent series, geometric series and the harmonic series. Series with non-negative terms, the Comparison Test, the Limit Comparison Test, the Ratio Test.
- **Continuity.** Limits of real functions, sums, products and quotients of limits. Continuity of real functions, sums, products and quotients of continuous functions, the composition of continuous functions. The standard results about continuous real functions: the Intermediate Value Theorem and the Boundedness Theorem.
- **Differentiability.** Differentiability of real-valued functions, sums, products and quotients of differentiable functions, Rolle's Theorem, the Mean Value Theorem, Cauchy's Mean Value Theorem.

Teaching & Learning Process (Hours Allocated To)

Lectures	Tutorials/ Example Classes	Practical Work/ Laboratory	Private Study	Total
22	11	0	67	100

Assessment and Feedback

- Coursework; Weighting within unit 20%
- 2 hours end of semester examination; Weighting within unit 80%

Further Reading

Rod Haggerty, Fundamentals of Mathematical Analysis, Addison-Wesley, second edition 1993.

Staff Involved

Dr Marcus Tressl - Lecturer

Data source is EPS system

[Back To Top](#)