MATH10242 - 2010/2011

General Information

- Title: Sequences and Series
- Unit code: MATH10242
- Credits: 10
- Prerequisites: MATH10101
- Co-requisite units: None
- School responsible: Mathematics
- Members of staff responsible: Prof. A Wilkie

Specification

Aims

The aims of this course are to develop an understanding of convergence in its simplest setting. To explain the difference between a sequence and a series in the mathematical context. To lay foundations for further investigation of infinite processes, in particular differential and integral calculus.

Brief Description of the unit

The notion of limit underlies the differential and integral calculus, a central topic in Mathematics. A good understanding of this concept was developed in the early nineteenth century, many years after the calculus was first used, and this is essential for more advanced calculus. The main purpose of this course is to provide a formal introduction to the concept of limit in its simplest setting: sequences and series.

Learning Outcomes

On successful completion of this module students will be able to

- know the definition of the limit of a sequence.
- be able to find the limit of a wide class of sequences.
- be able to decide on convergence or divergence of a wide class of series.
- know that a power series has a radius of convergence, and know how to find it.

Future topics requiring this course unit

Second year courses: Real and Complex Analysis, Applied Analysis courses, Numerical Analysis courses.

Syllabus

1. Null sequences, properties of the class of null sequences, the standard list of null sequences. Convergent sequences, properties of the class of convergent sequences, including Algebra of Limits. Sequences diverging to infinity, the Reciprocal Rule, subsequences and the subsequence strategy. Ratio Test, L'Hôpital's Rule and the Integral Approximation Rule for sequences. The Monotone Convergence Theorem and the sequence $(1+1/n)^2$.
2. Convergent series, the geometric series and the harmonic series. Series with non-negative terms, the Comparison Test, the Limit Comparison Test, the Ratio Test and the Integral Test. The Alternating Series Test, absolute and conditional convergence of series, power series and radius of convergence.

Textbooks

- R. Haggerty, *Fundamentals of Mathematical Analysis*, Addison Wesley, 1993

- V. Bryant. *Yet Another Introduction to Analysis*, C.U.P, 1990.

Teaching and learning methods

Two lectures and one examples class per week. In addition students should expect to do at least four hours private study each week for this course unit.

Assessment

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

Arrangements