



Unit information 2009–10

41 Advanced mathematical analysis (half unit)

This half unit is a course in real analysis, designed for those who already know some real analysis (such as that encountered in unit 116 Abstract mathematics). The emphasis is on functions, sequences and series in n -dimensional real space. The general concept of a metric space will also be studied.

Prerequisite

If taken as part of a BSc degree, units which must be passed before this half unit may be attempted:

116 Abstract mathematics.

Aims and objectives

The unit is designed to enable students to:

- develop further their ability to think in a critical manner
- formulate and develop mathematical arguments in a logical manner
- improve their skills in acquiring new understanding and experience
- acquire an understanding of advanced mathematical analysis.

Essential reading

There is no single textbook which corresponds to the subject exactly as it is treated here.

Please see the subject guide for six recommended textbooks. Three which are particularly useful are:

Bartle, R.G. and D.R. Sherbert *Introduction to Real Analysis*. (John Wiley and Sons: New York, 1999) third edition. [ISBN 9780471321484].

Binmore, K.G. *Mathematical Analysis: A Straightforward Approach*. (Cambridge University Press: Cambridge, 1982) second edition [ISBN 9780521288828].

Bryant, Victor Yet *Another Introduction to Analysis*. (Cambridge University Press: Cambridge, 1990) [ISBN 9780521388351].

Learning outcomes

At the end of this half unit and having completed the essential reading and activities students should:

- ✓ have a good knowledge of the mathematical concepts in real analysis
- ✓ be able to use formal notation correctly and in connection with precise statements in English
- ✓ be able to solve mathematical problems in real analysis
- ✓ be able to find and formulate simple proofs.

Assessment

This unit is assessed by a two hour unseen written examination.

Students should consult the *Programme Regulations for degrees and diplomas in Economics, Management, Finance and the Social Sciences* that are reviewed annually. The Prerequisites, Exclusions, and Syllabus are subject to confirmation in the *Regulations*. Notice is also given in the *Regulations* of any units which are being phased out and students are advised to check unit availability.

Syllabus

This is a description of the material to be examined, as published in the *Regulations*. On registration, students will receive a detailed subject guide which provides a framework for covering the topics in the syllabus and directions to the essential reading.

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After studying this unit, students should be equipped with a knowledge of concepts (such as continuity and compactness) which are central not only to further mathematical units, but to applications of mathematics in theoretical economics and other areas. More generally, a unit of this nature, with the

emphasis on abstract reasoning and proof, will help students to think in an analytical way, and be able to formulate mathematical arguments in a precise, logical manner.

Specific topics covered are:

- series of real numbers;
- series and sequences in n -dimensional real space \mathbb{R}^n ;
- limits, continuity and derivatives of functions mapping between \mathbb{R}^n and \mathbb{R}^m ;
- closed and open sets, compactness and other 'topological' ideas in \mathbb{R}^n ;
- metric spaces
- uniform convergence of sequences of functions.