

SYLLABUS FOR THE WRITTEN EXAMINATION IN ANALYSIS

The examination covers basic analytic properties of the real numbers and functions thereon. The following is a (not necessarily exhaustive) list of topics from which questions are drawn.

1. STRUCTURE OF THE REAL LINE

- Countable and uncountable sets, completeness property
- Open and closed sets, Bolzano-Weierstrass theorem
- Compactness, Heine-Borel theorem

2. SEQUENCES AND SERIES OF NUMBERS

- Definition of convergence of sequences and series of numbers, basic properties
- Necessary and sufficient conditions for convergence
- Conditional versus absolute convergence of series of numbers

3. FUNCTIONS OF A REAL VARIABLE

- Limits and continuity, properties of continuous functions, uniform continuity
- Differentiability, Mean Value Theorem and its consequences

4. THE RIEMANN INTEGRAL

- Definition and basic properties of the Riemann integral
- Necessary and sufficient conditions for integrability, upper/lower sums characterization of the integral
- Fundamental Theorem of Calculus and its consequences

5. SEQUENCES AND SERIES OF FUNCTIONS

- Definition of convergence of sequences and series of functions, basic properties
- Pointwise versus uniform convergence of sequences and series of functions, M-Test
- Power series and their properties

The material is found in a large number of texts, and is approached in a rather uniform fashion. Some texts that have been recently used are:

Bartle, *The Elements of Real Analysis*

DePree and Swartz, *Introduction to Real Analysis*

Krantz, *Real Analysis and Foundations*

Rosenlicht, *Introduction to Analysis*

Wade, *An Introduction to Analysis*