

Analysis and topology preliminary exam syllabus

References.

[M] James R. Munkres, *Topology*, 2nd ed., Prentice Hall, 2000.

[Ro] Maxwell Rosenlicht, *Introduction to analysis*, Dover, 1986.

[Ru] Walter Rudin, *Principles of mathematical analysis*, 3rd ed., McGraw-Hill, 1976.

Real analysis. [Ro, Chapters I–V; Ru, Chapters 1–7]

1. Sets and functions. Least upper bound property. Ordered fields.
2. Metric spaces. Open and closed sets. Limits of sequences. Cauchy sequences and completeness.
3. Compactness. Heine–Borel theorem. Connectedness.
4. Continuous functions. Uniform continuity. Sequences of functions. Uniform convergence.
5. Derivatives. Taylor’s theorem.
6. Riemann integral. Integrability.

Fundamentals of multivariable calculus. [S, Chapters 12–16; Ro, Chapters IX–X; Ru, Chapter 9]

1. Partial derivatives.
2. Multiple integrals.
3. Vector calculus.

Topology.

1. Topological spaces, bases, product topology, subspace topology. [M, 12–13, 15–16]
2. Closed sets, limit points, Hausdorff spaces. [M, 17]
3. Continuous functions, homeomorphisms. [M, 18]
4. Metric topology. [M, 20–21]
5. Connectedness, path-connectedness, compactness, Heine-Borel theorem. [M, 23–27]