

MATH 70100
Functions of a Real Variable
FALL 2017

Instructor: Jesenko Vukadinovic,

Time and Location: M,W 4:45-6:15, TBA

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Topics

- The Euclidean space (the linear structure and the scalar product, convergence of sequences, open and closed sets, compactness, connectedness)
- Metric spaces (density, completeness, continuous mappings, compactness, connectedness, Bolzano-Weierstrass property, Heine-Borel property)
- Differentiation in several variables (linear approximation of real-valued functions, approximating nonlinear mappings by linear mappings, the inverse function theorem, the implicit function theorem)
- Point set topology (Definitions of first and second countable, separable, Hausdorff, normal topological spaces; products of topological spaces; convergence, continuity, homeomorphisms; Urysohn's Lemma, Tietze Extension Theorem); compact spaces, locally compact spaces, Tychonoff's Theorem, Ascoli-Arzelà Theorem, Stone-Weierstrass Theorem; connectedness)
- Elements of functional analysis (normed vector spaces, linear functionals, Hahn-Banach theorem, Baire category theorem, open mapping theorem, closed graph theorem)
- Measures and integration (algebras and σ -algebras, measures, the Lebesgue-Stieltjes measure, measurable functions, the Lebesgue integral, monotone convergence theorem, dominated convergence theorem)

Books and resources

- Patrick M. Fitzpatrick, Advanced Calculus, Second Revised Edition
- Tom M. Apostol, Mathematical Analysis, Second Edition
- R. Bass, Real Analysis for Graduate Students, Version 3.1, <http://bass.math.uconn.edu/real.html>
- Gerald B. Folland, Real Analysis: Modern Techniques and Their Applications, Second Edition