

May 6, 2008

MA3105 Videregående reell analyse

Curriculum, Spring Term 2008

1. Fubini and Tonelli theorems for general measure spaces.
Absolutely continuous functions and the Fundamental Theorem of Calculus.
Application: Derivation under the integral sign, partial integration, substitutions in integrals.
Lebesgue-Stieltjes measures on the real line.
Signed measures, total variation. Mutually singular and absolutely continuous measures.
The Radon-Nikodym theorem.
(References: Stein & Shakarchi, "Real Analysis", parts of Chapters 3 and 6.
Notes from Royden, "Real Analysis", Chapter 5.)
2. The Birkhoff Pointwise Ergodic Theorem, with applications.
Poincaré's Recurrence Theorem.
(References: Stein & Shakarchi, "Real Analysis", parts of Chapter 6.
Notes from Walters, "An Introduction to Ergodic Theory".
Notes from Brin & Stuck, "Introduction to Dynamical Systems".
Notes from Khinchin, "Mathematical Foundations of Statistical Mechanics".)
3. Convolutions, Fourier transforms, Schwartz spaces and applications: The Prime Number Theorem, The Heisenberg Uncertainty Principle.
(References: Stein & Shakarchi, "Real Analysis", parts of Chapter 2.
Notes from Stein & Shakarchi, "Fourier Analysis".
Notes from Dym & McKean, "Fourier Series and Integrals".)
4. Sturm-Liouville systems and the spectral theorem for self-adjoint operators on a Hilbert space.
(References: Stein & Shakarchi, "Real Analysis", parts of Chapter 6.
Notes from Debnath & Mikusiński, "Hilbert Spaces with Applications".
Notes from Dixmier, "Von Neumann Algebras".)