

# Outline of Topics, Analysis I & II

## MATH 4317

Instructor: John McCuan

August 18, 2009

Here is a rough listing of topics to be covered in Undergraduate Analysis (as time permits).

1. Numbers
2. Functions I
3. Metric Space Topology (compactness, completeness, connectedness)
4. Sequences
  - (a) General properties
  - (b) Sequences in  $\mathbb{R}$ ,  $\mathbb{R}^n$ , and  $\mathbb{C}$
5. (Series)
6. Functions II
  - (a) Continuity and limits of function values
  - (b) Sets of functions and limits of sequences of functions
7. Differentiation
8. Integration
  - (a) Riemann Integral
  - (b) Stieltjes Integral (nonstandard measures)
  - (c) Fundamental Theorem of Calculus
  - (d) Change of variables
  - (e) Differentiation under an integral
  - (f) Integration by parts
  - (g) Exotic targets (metric space targets)
  - (h) Rectifiability
9. Functions III

- (a) Sequences and Series of functions (exponential/trig functions)
  - (b) Interchange of limits
  - (c) Stone Weierstrass Theorem
  - (d) Fourier Series
  - (e) Gamma Function
10. (Successive Approximation, Implicit Function Theorem)
11. Functions of several variables
- (a) Differentiation and Partial Derivatives
  - (b) Higher order derivatives
12. Integration on  $\mathbb{R}^n$  (differential forms/Stokes' Theorem/Fubini)
13. Measure Theory and the Lebesgue Integral