Syllabus for Qualifying Exam in Analysis

1 Introduction

The Qualifying Exam in Analysis is a 3 hour long written exam, offered twice a year, usually at the beginning of each spring and fall semester. The exact test dates are available on request from the Graduate Director. To advance in the Ph.D. program, the Qualifying Exam in Analysis must be passed with a “high pass”. Each student is given two attempts at passing this exam.

The topics covered by the exam are listed below, and are based on the courses

- Math 713/714 - Abstract and Real Analysis 1 & 2
- Math 715 - Complex Analysis

The Qualifying Exam is a closed book test, you may only use the test, a writing instrument, and the paper provided. All other material is prohibited. Please write legibly, use full sentences where appropriate, and quote any theorems you are relying on in your solutions.

Exam Topics for Math 713/714

1. Borel Measurable Functions and Borel Sets
2. The Lebesgue Outer Measure
3. The Lebesgue Measure and Lebesgue Measurable Sets
4. The Lebesgue Integral and its Properties
5. Abstract Measure Spaces and Measurable Functions
6. The Abstract Lebesgue Integral and its Properties
7. Product Measures and the Fubini Theorem
8. Extensions to Measures
9. Elements of Probability Theory: Random Variables and their Expectation
10. Derivatives and Dini Derivatives
11. Absolutely Continuous Functions
12. Signed Measures
13. The Radon-Nikodym Theorem
14. Decomposition of Measures

Exam Topics for Math 715

1. Sequences of Complex Numbers
2. Continuity and Uniform Convergence
3. Power Series of Complex Numbers
4. Analytic Functions
5. Complex Integration
6. Cauchy's Theorem and Integral Formula
7. The Maximum Modulus Principle
8. Isolated singularities
9. The Residue Theorem and its Applications to Real Integrals

References