

Syllabus for Oral Qualifying Exam

Riley Guyett

I Several Complex Variables

L. Hörmander, *An Introduction to Complex Analysis in Several Complex Variables*. (Chapters 2 & 4)

1. Cauchy Integral Formula
 1. Cauchy Integral Formula in Polydisks
 2. Hartogs Extension Theorem
 3. Bochner Extension Theorem
2. Subharmonicity and Convexity
 1. Subharmonic and Plurisubharmonic Functions
 2. Domain of Holomorphy, Continuity Principle
 3. Reinhardt Domains
 4. Log-Convexity, Pseudoconvexity, & Levi Pseudoconvexity
 5. Oka's Lemma
3. L^2 Theory for $\bar{\partial}$ on Pseudoconvex Domains
 1. L^2 Existence Theorem for $\bar{\partial}$ Operator
 2. Levi Problem

II Complex Geometry

P. Griffiths & J. Harris, *Principles of Algebraic Geometry*. (Chapters 0-2)

1. Complex Manifolds
 1. Stoke's Theorem
 2. De Rham and Dolbeault Cohomology
 3. De Rham Theorem and Dolbeault Theorem
 4. Submanifolds and Subvarieties
 5. Plurisubharmonic Functions, Divisors, & Currents
2. Kähler Manifolds
 1. Hodge Decomposition for Kähler Manifolds
 2. Kodaira-Serre Duality
 3. $\partial\bar{\partial}$ -Lemma on Kähler Manifolds
3. Kodaira Embedding Theorem
 1. Kodaira Vanishing Theorem

- 2. Curvature of Line Bundles
- 3. Adjunction Formulas
- 4. Chern Classes of Line Bundles
- 5. Blowing Up, Kodaira Embedding Theorem
- 4. Riemann Surfaces and Algebraic Curves
 - 1. Embedding Riemann Surfaces
 - 2. Riemann-Hurwitz Formulas
 - 3. Genus Formula
 - 4. Riemann-Roch Formula

III Elliptic Partial Differential Equations

D. Gilbarg & N. Trudinger, *Elliptic Partial Differential Equations of Second Order*. (Part I)

- 1. Classical Solutions
 - 1. Maximum Principles
 - 2. Schauder Interior Estimates
 - 3. Boundary & Global Estimates
- 2. Sobelev Spaces
 - 1. Weak Derivatives
 - 2. $W^{k,p}$ Spaces
 - 3. Sobelev Embedding Theorem
 - 4. Morrey & John-Nirenberg Estimates
- 3. Weak & Strong Solutions
 - 1. Marcinkeiwicz Interpolation Theorem
 - 2. Calderon-Zygmund Inequality
 - 3. L^p Estimates
 - 4. De Giorgi-Nash-Moser Iteration
 - 5. Hölder & Harnack Estimates