MAT 536
COMPLEX ANALYSIS I

Instructor: Blaine Lawson
Office: 5-109. Hours: Mon. 4:00-5:30 and Tues. 2:30-4:00.

Grader: Xuntao Hu

Text: *Complex Analysis, Third Edition*, by Lars Ahlfors
Lectures Mon-Wed. 2:30 – 3:50 in Earth and Space Sciences 177.
Homework due: The beginning of class every Monday.

Midterm Exam: Monday, March 19th.
Final Exam: Tuesday, May 8th, from 5:30 to 8:00 PM.

Final Grade: 30% Homework, 30% Midterm, 40% Final.

DETAILED SYLLABUS

1. Complex Numbers.

2. Complex Differentials.
    - Holomorphic functions
    - Cauchy-Riemann equations
    - Properties
    - Power series
    - Elementary functions

3. Holomorphic functions as Mappings
    - Conformality
    - The Riemann sphere
    - Linear fractional transformations
    - Rational functions

4. The fundamental Theorem
    - Green's Theorem
    - Complex differentials
    - Cauchy's Theorem and Cauchy's Integral Formula
    - Cauchy's Inequalities and consequences
    - Uniform limits of holomorphic functions
    - Analyticity of holomorphic functions

5. Local Properties

- Removable singularities
- Zeros, poles and essential singularities
- Local form of a holomorphic function
- Maximum Modulus Principle
- Schwarz's Lemma

6. Residues
   - The Residue Theorem
   - The Argument Principle and Rouché's Theorem
   - Applications to definite integrals

7. Infinite Series
   - Taylor and Laurent series
   - Infinite Products

8. Normal Families

9. The Riemann Mapping Theorem

10. Harmonic Functions
    - Mean value property
    - Poisson's Formula
    - Schwarz's Theorem
    - The Reflection Principle
    - The Dirichlet Problem

11. The Big Picard Theorem

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