Course syllabus for Math 4320
Complex Analysis

Fall 2015

Course description: This is an introductory course in complex analysis.

Text: Complex Analysis by L. Ahlfors, 3rd edition

Time and place: MWF 11:05-11:55. Skiles 255. Webpage via T-square.

Instructor and office hours: Kirsten Graham Wickelgren, e-mail: kwickelgren3@math.gatech.edu, office: Skiles 227, office hours: Wednesday 12, Friday 10, or by appointment.

Prerequisites: Math 2401 Calculus III. A significant portion of the material will involve rigorous proofs, and students will need to write and understand them.

Course objectives:

- Geometry of the complex plane, triangle inequalities, geometric proof of the fundamental theorem of algebra.
- Analytic functions: Continuity and differentiability, the Cauchy-Riemann equations. Complex functions in one variable as maps of the complex plane into itself. Elementary analytic functions, for example the logarithm.
- Line integrals, the Cauchy integral formula. Morera's theorem.
- Series: Taylor and Laurent expansions.
- Residue calculus for definite integrals.
- Harmonic functions and analytic functions: conjugate harmonics, conformal invariance of Laplace's equation in the plane, the Cauchy-Riemann

equations and conformal maps, Poisson kernel derived from Cauchy's formula; solution of boundary value problems for Laplace's equation by conformal mapping.

- Prime number theorem, following D. Zagier's article *Newman's Short Proof of the Prime Number Theorem.*

Homework, exams, and grading: There will be be weekly problem sets, two in-class midterms tentatively scheduled for September 23 and November 2, and a final exam. A selection of the problems in the problem sets will be graded, and completeness will be checked. Proofs will be required for the majority of problems. Homework is due Friday in class. Grades will be based 20% on homework, 25% on each midterm, and 30% on the final. You are encouraged to work together on the homework. You are also free to consult any references you wish to complete the homework. Any sources you use or collaborators you consult must be credited in writing on your work, of course. No references are to be consulted during the exams.

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