COURSE INFORMATION FOR MATH4460 (SPRING 2023)
COMPLEX VARIABLES

Instructor: Yongyi Chen
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Lectures: MWF 3:00 pm–3:50 pm in Gasson Hall 301
Homework: Weekly, due on Wednesdays at 11:59 pm.

Office: Maloney 532
Office hours: (tentative) Mondays 4-5 pm, Wednesdays and Fridays 1-2 pm in Maloney 532.

1. Course information

Course website. On Canvas. There you will find homework assignments, homework solutions, and supplemental course materials.

Course format. In person. I may change hours or add more office hours based on demand.

Textbooks. We will be following Ahlfors, *Complex Analysis*, 3rd edition.

Homework. There will be weekly homework, due on Wednesdays at 11:59 pm. Because homework solutions will be posted on Canvas, late homework will not be accepted. To submit your homework, upload a single PDF file to Gradescope (accessible from within the Canvas assignment page as well).

You are encouraged to collaborate on homework with your classmates, but the work that you turn in must be your own and must be written in your own words. Working together is good; copying somebody else's work is plagiarism.

Writing style counts as much as having the right answer (often you will be told the answer and asked to justify it). Homework solutions must be written in complete sentences, and must be clear, concise, and readable. A correct but poorly expressed solution will not receive full credit.

Typesetting your homework using LaTeX is strongly encouraged, but not required.

Exams and grading. There will be two in-class exams (50 minutes each) and a final (120 minutes). Final grades will be determined by a weighted average of homework and exam scores. Homework counts for 20%, each in-class exam counts for 20%, and the final counts for 40%.

All exams will be given in class. Exam dates and times are as follows:

- Exam 1: March 1, 2023, 3:00 pm, in class.
- Exam 2: April 19, 2023, 3:00 pm, in class.
- Final exam: To be determined.

Academic integrity. Cheating of any kind will result in a failing grade for the course and referral to the Dean's office for disciplinary action. For more information on academic integrity see `https://www.bc.edu/integrity`.

2. List of topics

(1) Complex numbers and why we care about them
   - The complex plane, representation in Cartesian and polar coordinates
   - The Riemann sphere

(2) Analytic (holomorphic) functions
   - Complex limits, continuity, and derivative, Cauchy-Riemann equations
   - Analytic (holomorphic) functions, first examples
   - The complex exponential and trigonometric functions, and periodicity
   - Multi-valued functions and the complex logarithm

(3) Complex integration
   - Line integrals
   - Cauchy's Theorem
   - Cauchy's integral formula
   - Local properties of holomorphic functions: zeros and poles, maximum principle
   - Residue theorem and applications

(4) Extra optional topics (decided by popular demand)
   - Infinite series and product expansions of holomorphic/meromorphic functions
   - Analytic continuation
   - Special functions (Gamma function, Riemann zeta function, elliptic functions)
   - Möbius transformations and the upper half plane
   - Proof of the prime number theorem
   - Riemann surfaces