MATH 4552: COMPLEX ANALYSIS

Instructor. Sachin Gautam. Office MW 640. gautam.42@osu.edu

Office hours. Tuesdays 2-4PM. Wednesdays 3-4PM. Or, by appointment.

Course Information

Homepage. https://people.math.osu.edu/gautam.42/S20/complex.html

Class time and place. MWF 12.40-1.35PM. MacPherson Lab 1008.

Textbook. This course will be based entirely on lectures. I will upload the lecture notes, periodically, at the following link. So, in case you miss a class (**not recommended**) you can download the notes.

https://people.math.osu.edu/gautam.42/S20/notes.html

Contents. This is a one-semester introductory course on complex analysis. Our focus will be on methods and applications of complex function theory and contour integration. The course will often follow the "definitions → examples → theorems → applications" style. We will go over almost all the proofs of the results we encounter, but the real emphasis will be kept on problem–solving, which will also form the basis on which you will be evaluated.

Grading. Your overall grade will be determined by:

- Homework 20%.
- Quizzes 5%.
- Two midterm exams, in-class 30%.
- One midterm exam, take home 15%.
- Final exam 30%.

See the course schedule on page 3 for the dates of quizzes and exams.

Homework. I will upload several problems for practice (almost) every week at:

https://people.math.osu.edu/gautam.42/S20/homework.html

Homework will be assigned from these *problem sheets* and will be due the week after (see course schedule for precise dates). It is an integral component of the course, and absolutely indispensable in order to get a good grade, as well as understand the material. If you are having trouble with the homework, it will be essential to seek help: ask questions in class, come to office hours, discuss with friends and so on. You are encouraged to work together on homework problems, but your write-ups must be your own. **Late homework will not be accepted.**

General Policies

Academic Misconduct. It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp).

Disability Services. Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; http://www.ods.ohio-state.edu/

Course Schedule

The following schedule is tentative only. You will be notified of any changes by email, or in class. The most recent version of this syllabus will remain available at
https://people.math.osu.edu/gautam.42/S20/syllabus.pdf

Week	Topics	HW/Quiz
1 1/6-10	Complex numbers. Algebraic operations. Polar form. Triangle inequality. n^{th} roots.	HW1 due on 1/17
2 1/13-17	Functions of a complex variable. Domains, limit, continuity. Point at ∞. Differentiability.	HW2 due on 1/24 Q1 on 1/15 W
January 20 - Martin Luther King day, no class		
3 1/22-24	Cauchy–Riemann equations. Derivatives: elementary properties. Harmonic functions.	HW3 due on 1/31
4 1/27-31	Examples. Exponential, logarithm, trigonometric functions. z^a. Multivalued functions and branch-cuts.	No homework Q2 on 1/31
Mid term 1 on Wednesday February 5.		
5 2/3-7	Review I. Mid term I. Review of Riemannian integration.	
6 2/10-14	Contour integrals. Basic properties and inequalities. Antiderivatives. Cauchy's theorem.	HW4 due on 2/21
7 2/17-21	Cauchy's theorem cntd. Simply–connected subsets. Cauchy's integral formula. Winding number.	HW5 due on 2/28 Q3 on 2/21
8 2/24-28	Applications of Cauchy's theorem. Liouville's theorem. Fundamental theorem of algebra. Rational functions.	
Mid term 2 on Wednesday March 4.		
9 3/2-6	Review II. Mid term II. Review of sequences and series.	
Spring break - March 9-13.		
Spring break cntd. - March 16-20.		
10 3/23-27	Uniform convergence. Power series. Abel's theorem. Taylor/Laurent series. Poles and essential singularities.	HW6 due on 4/3
11 3/30-4/3	Poles and residues. Applications to real integrals. Jordan's lemma. Integral transforms.	HW7 due on 4/10
12 4/6-10	Weierstrass' theorem on infinite products. Euler's Gamma function.	
Mid term 3 (take home) assigned 4/14 9AM; due 4/15 9AM.		
13 4/13-17	Gamma function cntd. Doubly–periodic functions. Jacobi's theta function.	HW8 due on 4/24
14 4/20-24	Elliptic functions cntd. Jacobian sine and cosine functions. Addition formulae.	
Final exam (take home) assigned 4/30 9AM; due 5/1 1PM.		