Lecture: Mon-Wed, 2:50pm–4:30pm, Richards Hall 241.

Instructor: Evan Dummit, Lake Hall 571, edummit@northeastern.edu.

Office Hours: Mon-Wed 1:30pm-2:30pm + Wed 4:45pm-5:45pm or by appointment, Lake Hall 571.

Course Webpage: https://dummit.cos.northeastern.edu/teaching_fa25_4555.html.

Course Textbook: The instructor will write lecture notes for the course (in lieu of an official textbook) as the semester progresses. An approximate equivalent is Saff/Snider's "Fundamentals of Complex Analysis", but we do not use this text in the course.

Prerequisites: Math 2321 (Calculus 3) or instructor's permission.

Course Philosophy: The goal of this course is to give an introduction to complex analysis, which studies the behavior of functions of a complex variable $z = x + iy$ from both a computational and theoretical perspective.

Complex analysis is a natural extension of the methods of calculus and real analysis to functions defined on the complex plane, and many of the underlying ideas and questions are very similar (e.g., studying derivatives, integrals, series expansions, and convergence). However, in contrast with the wide variety of unusual behaviors and pathological examples typically encountered in real analysis, complex-differentiable functions behave far more nicely than mere real-differentiable functions, resulting in a much cleaner theory overall.

In this advanced undergraduate course, much of the learning, and many of the secondary topics, are developed through the homework assignments. Proof is a central theme in this course, and the homework assignments and exams will emphasize proofs and problem-solving, with performing computations a secondary component.

Grades: Your course grade consists of **40% homework** and **60% exams**.

The homework score consists of the average of the written assignment scores, with the lowest score dropped.

The in-class midterm (100 points) is Wednesday, October 29th, the in-class component of the final exam (20 points) is Wednesday, December 3rd, and the take-home component of the final exam (100 points) is due Thursday, December 11th. Students who have an A average on the homework and in-class exam components are excused from the take-home portion of the final.

An overall score of 90% will be **at least** an A, 88% will be **at least** an A-, 86% will be **at least** a B+, 80% will be **at least** a B, 78% will be **at least** a B-, 76% will be **at least** a C+, and 70% will be **at least** a C.

If you feel that an assignment or exam has been misgraded, please talk to the instructor directly. Requests for regrading will not be considered more than two days past the date the assignment or exam was returned.

Homework Assignments: Written assignments will be assigned weekly and due via Gradescope on Canvas at 5am on Fridays (think of this as "Thursday evening"), with a 24-hour late period.

It is highly recommended to start work on the assignments early: many problems will require substantial thought and effort to solve, even if the solution is ultimately fairly short. Do not fall into the trap of only starting the assignment the evening before it is due!

The lowest assignment grade is dropped, to provide you a cushion if an emergency arises and you cannot complete an assignment (a zero grade assessed for misconduct may not be dropped). **Assignments may be submitted late, but late submissions may be penalized at the grader's discretion.**

Written assignments should be organized carefully, neatly, and in complete sentences, with concise well-reasoned logical arguments. Cite any external resources used, and clearly label all problems. All electronic submissions are expected to be easily readable. **Failure to adhere to any of these guidelines may result in point deductions, at the grader's discretion.**

Collaboration Policy: Mathematics is fundamentally a collaborative endeavor, and discussing the course material with others is an excellent way to solidify your own understanding. However, it is critical not to outsource your learning! You cannot expect to retain knowledge if you do not solve your homework problems yourself, whether because you relied on other people to explain to you how to do the problems, or because you relied too heavily on technological assistance.

On written assignments, you may work together with other people, **but you must write up your work independently**.

Course Schedule: The course and lecture notes are tentatively organized into five chapters, as follows:

Weeks 1-2: Chapter 1 $\sim$ Complex Numbers and Derivatives: Complex arithmetic, polar and exponential forms, topology of $\mathbb{C}$, limits, complex derivatives, the Cauchy-Riemann equations

Weeks 3-5: Chapter 2 $\sim$ Complex Power Series: formal power series, convergence of sequences and series, continuity and differentiability, elementary functions as series

Weeks 5-7: Chapter 3 $\sim$ Complex Integration: Contours, line integrals, path independence, Cauchy's integral theorem, winding numbers, Cauchy's integral formula

Weeks 8-11: Chapter 4 $\sim$ Applications of Cauchy's Integral Formula: Liouville's theorem, maximum modulus, zeroes and poles, singularities, residue calculus

Weeks 11-14: Chapter 5 $\sim$ Local Behavior of Holomorphic Functions: Rouché's theorem, the fundamental theorem of algebra, the Riemann sphere fractional linear transformations, conformal mapping, functions on the unit disc, harmonic functions, boundary value problems.

Resources and AI Policy: If you use **any** external resources (e.g., wikipedia, stackexchange, other books beyond the course text or notes, other people, etc.) you must say what results you are citing and where they are from. If you happen to find a solution to an assigned problem online or elsewhere, it is plagiarism to present it as your own work without attribution of its source.

Use of generative AI or equivalent technology (e.g., ChatGPT, Claude) is expressly forbidden in this course. This includes asking for hints or solutions to assigned problems, checking solutions, searching or summarizing course-related content, and outlining drafts of submitted work.

Although the course lectures and notes provide a basic introduction to the course material, you will not actually understand the ideas until you have used them to solve new problems yourself. **Using generative AI to assist with solving the homework problems thus short-circuits your learning**, because you will not have worked through the problems as fully as you should have. Additionally, generative AI technology operates as a statistical predictor, making guesses about the most likely valid response based on its library of training data. This technology produces confident and authoritative answers, but it is not infallible, and in fact often makes mistakes both small and large.

The instructor reserves the right to require any student to explain any submitted work in person; failure or inability to do so satisfactorily will be considered evidence that the work is not your own.

If plagiarism or AI use is detected on an assignment, you will receive a warning and an automatic zero on the assignment. Another violation after the warning will result in an automatic F in the course.

Attendance Policy: It is expected that you will attend every class. This course moves very fast, and it is quite possible to fall behind even if you only miss one day. If you miss class for any reason, it is highly advisable to consult the course lecture notes and to watch the recording of the lecture you missed. It is your responsibility to be aware of all information announced in class, including modifications to the course syllabus or schedule, even if you are absent.

If you will be absent from a class activity due to a religious observance or practice, or for participation in a university-sanctioned event (e.g., university athletics), it is your responsibility to inform the instructor during the first week of class and provide appropriate documentation if required.

Statement on Academic Integrity: A commitment to the principles of academic integrity is essential to the mission of Northeastern University. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University. Violations of academic integrity include (but are not limited to) cheating on assignments or exams, fabrication or misrepresentation of data or other work, plagiarism, unauthorized collaboration, and facilitation of others' dishonesty. Possible sanctions include (but are not limited to) warnings, grade penalties, course failure, suspension, and expulsion.

Statement on Accommodations: Any student with a disability is encouraged to meet with or otherwise contact the instructor during the first week of classes to discuss accommodations. The student must bring a current Memorandum of Accommodations from the Office of Student Disability Services.

Statement on Inclusivity: Faculty are encouraged to address students by their preferred name and gender pronoun. If you would like to be addressed using a specific name or pronoun, please let your instructor know.

Statement on Evaluations: Students are requested to complete the TRACE evaluations at the end of the course.

Miscellaneous Disclaimer: The instructor reserves the right to change course policies, including the evaluation scheme of the course. Notice will be given in the event of any substantial changes.