MATH 103A: Complex Analysis (W21)   Syllabus

Basic Course Information

Instructor: Jadyn V. Breland[1] (Pronouns: he/him/his.)   **Office Hours:** To be determined.

Email: jbreland@ucsc.edu (§Guidelines)   **Personal Webpage:** http://jadynbreland.com

Prerequisites: MATH 23B; and either MATH 100 or CSE 101.

Textbook: *Complex Variables and Applications*, Brown and Churchill, 9th edition.

Lectures: The course will consist primarily of synchronous lectures via Zoom. The lectures will occur on Tuesdays & Thursdays from $1:30\,\text{PM} - 3:05\,\text{PM}$. **The Zoom room information will be posted on Zulip**. The first lecture is on January $5^{\text{th}}, 2021$ and the last lecture is on March $11^{\text{th}}, 2021$.

Course Webpage: The course web page is located at https://people.ucsc.edu/~jbreland/teaching/W21_MATH103A.html. The hand-written notes from the lectures will be posted here, as well as any assignments.

Teaching Assistant: Yufei Zhang yzhan544@ucsc.edu   **TA Office Hours:** To be determined.

Discussion Sections: Mondays $4:00\,\text{PM} - 05:05\,\text{PM}$ (or) Tuesdays $5:20\,\text{PM} - 6:25\,\text{PM}$ via Zoom. Sections start January 11th.

Important: You are required to enroll in and attend one of the sections. You must enroll in the section you will attend via https://my.ucsc.edu, or else you will not be able to submit the weekly quizzes on Canvas. (Swapping a Section on myUCSC, §Assessments, §Section Guidelines)

Canvas: The Canvas webpage will be primarily used for hosting grades. You will also need to use Canvas to submit the weekly quizzes.

Zulip: We will be using Zulip as a discussion forum for anything and everything course related. Our forum is located here: https://math103a.zulipchat.com/.   (§Zulip Guidelines)

Equity & Inclusion: I recognize that students' remote learning environments and responsibilities outside of school differ. If there is an element of the course that is inaccessible to you, or impossible or difficult for you to complete, please contact me as soon as possible to discuss the best way to ensure your full participation in the course.

Learning Objectives, Content, & Tentative Lecture Schedule

Learning Outcomes: Upon successful completion of the course, students will be able to do the following within the topic of complex analysis:

1. Read and write expository text on elementary aspects.

2. Distinguish truth from falsehood.

3. Provide examples and counterexamples of statements.

4. Perform needed computations.

5. Construct concise and correct proofs.

Course Content: Complex numbers and algebraic properties, limits, continuity and derivatives, Cauchy-Riemann equations, analytic functions, elementary functions, contour integration, Cauchy-Goursat theorem,

---

[1]Please address me by my first name.

Cauchy's integral formula, Morera's theorem, maximum moduli of functions, Liouville's theorem and the fundamental theorem of algebra, Taylor series and Laurent series, residues and poles, Cauchy's residue theorem, application of residues including computation of indefinite integrals.

Schedule of Lectures: The following tentative lecture schedule follows the textbook: *Complex Variables with Applications*, Brown & Churchill, Ninth Edition.

	Tuesday	Thursday	Topics
Week 1	Ch 1: Sections 1-6	Ch 1: Sections 7-12	Complex numbers
Week 2	Ch 2: Sections 13-16	Ch 2: Sections 17 - 20	Analytic Functions
Week 3	Ch 2: Sections 21-23	Ch 2: Sections 25,26,28	Analytic Functions Cont.
Week 4	Ch 3: Sections 30-35	Ch 3: Sections 36-40	Elementary Functions
Week 5	Ch 4: Section 41-45	Ch 4: Sections 46-50	Integrals
Week 6	Ch 4: Sections 51-54	Ch 4: Sections 55-59	Integrals cont.
Week 7	Ch 5: Sections 60-63	Ch 5: Sections 64-67	Series
Week 8	Ch 5: Sections 68-70	Ch 5: Sections 70-73	Series Cont.
Week 9	Ch 6: Sections 74-79	Ch 6: Sections 80-84	Residues and Poles
Week 10	Ch 7: Sections 85-90	Ch 7: Sections 91-95	Applications of Residues

Assessment

Assessment Distribution: Your *score* is a real number between 0 and 100, calculated as the weighted average of the following assessments.

- PROBLEM SETS (40%)

  There will be weekly problem sets, approximately 8 of them. The first problem set will be **released Monday, January** 4th and will be **due Friday, January** 15th **by 11:59 PM**. Thereafter, the problem sets will be **released on Fridays, starting on January** 8th, and will be **due on Friday the following week by 11:59 PM**. There will be no problems set due during the week of the midterm. The first problem set will be slightly longer than the others. A random subset of the assigned problems will be graded for credit. The lowest score will be dropped at the end of the quarter. Your submission must be typeset using LaTeX. You will submit your work via Gradescope. (§Problem Set Guidelines)

- SECTIONS (10%)

  You must register for (via my.ucsc) and attend one section per week. There will be low-stakes quizzes during sections. The lowest two scores will be dropped. You are not required to use LaTeX for quizzes. You will submit your work via Canvas. (§Section Guidelines)

- MIDTERM (25%)

  This take-home exam will be **released on Friday, February** 12th and will be **due on Friday, February** 19th **at 11:59PM**. The exam will be based on material covered in lecture up to and including Thursday, February 11th. Your submission must be typeset using LaTeX. You will submit your work via Gradescope. (§Exam Guidelines)

- ◻ FINAL EXAM (25%)

    This cumulative take-home exam will be **released on Friday, March 12**[th] and will be **due on Friday, March 19**[th] **at 11:59PM**. Your submission must be typeset using LaTeX. You will submit your work via Gradescope. (§Exam Guidelines)

LaTeX: LaTeX (LAH-tekh or LAY-tekh) is the preferred choice among mathematicians for creating mathematical documents. You will need to learn basic LaTeX for this course. This will likely be done by looking at the `.tex` (tekh, the LaTeX file extension) files that I provide you, mimicking the LaTeX in those files, and googling anything that is not included in those files (TeX Stack Exchange should have answers to almost all your queries). I expect that most of you will be able to pick up the basics very easily. You can start this journey by using Overleaf, an easy-to-use online LaTeX editor. **Please contact me if this is not a viable option for you for any reason**, and, of course, if you need help getting started.

Gradescope: The following assignments will be submitted via Gradescope: all problem sets and all take-home exams.

Extra Credit: You can earn *extra credit* by actively participating in discussions on Zulip throughout the quarter. Extra credit, **a maximum of 4 points**, will be added to your score at the end of the quarter. Extra credit is awarded at the instructors sole discretion.

Letter Grades: Your *final score* is the real number calculated as follows: (final score) = (score) + (extra credit). Your final letter grade depends on your final score. Final letter grades are assigned according to the following final score ranges:

A+	96-100	B+	86-89	C+	76-79	D+	66-69	F	0-59
A	93-95	B	83-85	C	73-75	D	63-65		
A-	90-92	B-	80-82	C-	70-72	D-	60-62		

Final score ranges may be adjusted (to your advantage) according to class performance. Final scores falling in between two ranges will be rounded up. For example, according to the ranges above a final score of 75.1 will earn the letter grade C+ (rounded up), whereas a final score of 74.9 will earn the letter grade C (no rounding).

Guidelines

Sections & Quizzes

- ▷ There will be low-stakes quizzes during sections. They will be based on material from the week prior. There is no need to study specifically for a quiz.
- ▷ Attend section once per week to take the quiz. It doesn't matter which section you attend (there are two).
- ▷ You may consult the textbook, the lecture notes, or your classmates or TA during the quiz.
- ▷ Submit your work via Canvas. Note: you are not required to use LaTeXfor the quizzes.

Problem Sets

- ▷ Turn in the problem set on the due date. Submit your work via Gradescope. (If you need an extension, please ask, but make sure you ask before the due date. Late submissions will not be accepted without prior authorization.)
- ▷ You may discuss the problem set with your peers on Zulip (or elswhere). Collaboration with your peers is encouraged, but please name your peers with whom you have discussed the problem set.
- ▷ You are **NOT** allowed to copy someone else's work.

▷ You are **NOT** allowed to let someone else copy your work.

▷ Write your work, **individually and in your own words**, using LaTeX.

▷ Pay close attention to the presentation and clarity of your reasoning in your answers. The ability to communicate effectively is just as important as solving a problem correctly.

▷ I expect your solutions to be well-written, neat, and organized. Do not turn in rough drafts or scratch work. What you turn in should be the "polished" version of potentially several drafts.

▷ Properly cite any resources you have used while solving the problem set.

Take-Home Exams

▷ Turn in the exam on the due date. Extensions will not be granted for take-home exams, except under extreme circumstances. Late submissions will not be accepted without prior authorization. Submit your work via Gradescope.

▷ Write your work using LaTeX.

▷ Do not discuss the exam with anyone, including your peers, until after the due date. You may ask general clarifying questions on Zulip.

▷ Pay close attention to the presentation and clarity of your reasoning in your answers. The ability to communicate effectively is just as important as solving a problem correctly.

▷ I expect your solutions to be well-written, neat, and organized. Do not turn in rough drafts or scratch work. What you turn in should be the "polished" version of potentially several drafts.

▷ You may consult the textbook and the lecture notes while working on an exam. However, **you are forbidden from consulting any other resources, including, but not limited to, other textbooks, the internet, Chegg, and math.stackexchange.**

Communication

▷ Course announcements will be made primarily via Zulip and NOT canvas. (§Zulip Guidelines)

▷ If your question is math-related, please contact me on Zulip.

▷ If your question is of a sensitive or personal nature, please send me an email: `jbreland@ucsc.edu`. Include "MATH 103A" in the subject line.

▷ Please make sure you give me as much information as you possibly can about the subject you intend to discuss when you contact me.

▷ **Never hesitate to reach out, I always want to hear from you.**

Zulip

▷ You will receive an invitation via email to join Zulip. Please sign up with your first and last name as your username.

▷ The Zulip forum is organized into streams. Here are a few examples:

* **general:** General discussion about the course, the lecture, or mathematics in general occurs here. You can ask questions, and any member of the class can respond.

* **problem sets:** There will be a stream for each problem set. You can ask questions about the problem set, and any member of the class can respond.

* **LaTeX:** General questions about using LaTeX can go here. Any member of the class can respond.

Posts in each stream can be organized by topic, e.g. "problem 1" or "Cauchy's integral formula".

▷ Zulip has basic in-line LaTeX built in, which makes it easy to discuss mathematics. Whenever typing mathematical expressions, please use LaTeX by surrounding your code with the symbol "$$" on each side.

▷ Use Zulip to discuss anything and everything course related, especially: problem sets and questions about math or LaTeX .

    ▷ The instructor and TA will read posts on Zulip periodically to answer some questions, but the goal is to promote collaboration with your peers. Try discussing your question with the rest of the class!

    ▷ Always be kind, courteous, and respectful.

I RESERVE THE RIGHT TO CHANGE ANY PARTICULAR PART OF THE SYLLABUS ABOVE.

YOU WILL BE PROMPTLY NOTIFIED OF ANY CHANGES VIA ZULIP AND THE COURSE WEB PAGE.

Other Important Information

Key dates for Registration & Enrollment:
https://registrar.ucsc.edu/soc/key-dates-enrollment.html

Mathematics Department's Enrollment Info:
https://www.math.ucsc.edu/courses/enrollment-info.html

DRC Remote Accommodations: UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me privately during my office hours or by appointment, preferably within the first two weeks of the quarter. At this time, I would also like us to discuss ways we can ensure your full participation in the course. I encourage all students who may benefit from learning more about DRC services to contact the DRC by phone at $831 - 459 - 2089$ or by email at drc@ucsc.edu.

CAPS (Counseling and Psychological Services): This is a stressful time, so if you are in distress, managing heightened stress and anxiety, or want to get more support and a counselor's perspective on something you're going through, CAPS provides a variety of services for your needs, please visit their website for more information https://caps.ucsc.edu.

Academic Integrity: Academic integrity is the cornerstone of a university education. Academic dishonesty diminishes the university as an institution and all members of the university community. It tarnishes the value of a UCSC degree. All members of the UCSC community have an explicit responsibility to foster an environment of trust, honesty, fairness, respect, and responsibility. All members of the university community are expected to present as their original work only that which is truly their own. All members of the community are expected to report observed instances of cheating, plagiarism, and other forms of academic dishonesty in order to ensure that the integrity of scholarship is valued and preserved at UCSC. For the full policy and disciplinary procedures on academic dishonesty, students and instructors should refer to the Academic Integrity page at the Division of Undergraduate Education.

Title IX: The Title IX Office is committed to fostering a campus climate in which members of our community are protected from all forms of sex discrimination, including sexual harassment, sexual violence, and gender-based harassment and discrimination. Title IX is a neutral office committed to safety, fairness, trauma-informed practices, and due process. Title IX prohibits gender discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking. If you have experienced sexual harassment or sexual violence, you can receive confidential support and advocacy at the Campus Advocacy Resources & Education (CARE) Office by calling (831) 502-2273. In addition, Counseling & Psychological Services (CAPS) can provide confidential, counseling support, (831) 459-2628. You can also report gender discrimination directly to the University's Title IX Office, (831) 459-2462. Reports to law enforcement can be made to UCPD, (831) 459-2231 ext. 1. For emergencies call 911.