Math 352 Fall 2019
Complex Analysis

MWF 11:00-11:50AM (Lovejoy 103)

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Office Hours:	Tuesday 10:00-11:30AM, Wednesday 6:00-8:00PM,
	Thursday 6:00-8:00PM, & by appointment
Course Website:	`http://personal.colby.edu/~erandles/M352.html`
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The shortest path between two truths in the real domain passes through the complex domain. – Jacques Hadamard

Complex Analysis: Come and see how good things can be. – George Welch

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Course Description: There are not enough real numbers. For example, to solve the simple polynomial equation

$$x^2 + 1 = 0,$$

one needs to consider a system of numbers which is "larger" than the real numbers $\mathbb{R}$; these are the complex numbers $\mathbb{C}$. We shall view $\mathbb{C}$ both as a system of numbers that can be added, subtracted, multiplied and divided, and as a plane on which we can do geometry. As single-variable calculus studies functions on the real line, complex analysis focuses on the study of functions defined on the complex plane. For a special class of functions on the complex plane, called analytic functions, incredible truths hold. The main focus of this course is to study these analytic functions and their properties. In doing so, we will learn the basic calculus of analytic functions, contour integration in $\mathbb{C}$, Cauchy's integral theorem and its consequences, Laurent series, and the calculus of residues. Perhaps best of all, we will study a number of important applications, many of which seem at first to have nothing to do with complex analysis. Time permitting, we will also study conformal maps.

Prerequisites: Mathematics 122 and 274; or Mathematics 161 and 162.

Textbook: *Complex Variables and Applications* by J. Brown and R. Churchill, 8th ed.

You are expected to read the course textbook carefully, thoroughly and – ideally – before you come to class. As you know from Mathematics 274, reading a mathematics textbook means to read with a pencil/pen in hand and work out all details carefully, especially those made within the course of a proof. When creating material for this course (the homework, exams, quizzes etc.), I like to draw from many different sources. In addition to the course textbook, I will often consult *Basic*

Complex Analysis by J. Marsden and M. Hoffman; *Invitation to Complex Analysis* by R. P. Boas; and *Functions of One Complex Variable I* by J. Conway. While you are not required to obtain these texts, you may want to take a look at them, especially if you plan to continue your studies of complex analysis after this course.

Grading: Your grade will be calculated as follows:

Class participation:	5%
Weekly homework assignments:	20%
Weekly quizzes:	20%
Midterm:	25%
Final Exam:	30%

Exams: This course will have one midterm exam and a final exam. The exams will be at the following dates and times:

Midterm	**Wednesday, November 6th from 7:00-9:00PM**
Final Exam	**Friday, December 13th from 9:00AM-12:00PM**

The midterm exam will be held in Lovejoy 100. It is crucial that you reserve these time slots for these exams. In the event that you are unable to attend a midterm exam, you must let me know at least **two weeks** prior to the exam date.

Attendance and Class Participation: As participation is a big part of this course, class attendance is required. Excuses may be granted for critical emergencies (normally verified by the Dean of Students) and illness (normally verified by the College Health Center). Absences for official Colby activities require prior approval and absences for religious reasons will be considered excused if the policy in the college catalogue is followed. To learn mathematics, it is essential to communicate it and to discuss it with others. I encourage you to ask questions! You will be required to participate in class discussion and you will frequently be called on during lecture. Failure to adhere to these policies, including missing too many classes (≥ 3), will result in grade penalties, academic warnings, and eventually dismissal from the class.

Homework: Homework is the most important part of this course. It is where you will grapple with new ideas, come up with creative solutions and communicate your thoughts and understanding to others. Consequently, it is crucial that you take homework very seriously. You should start homework early and work diligently. If you are having substantial difficulty with a particular exercise, please come talk to me during office hours. I am here to help! You are permitted and encouraged to discuss homework with your classmates, however, when it comes time to write up your solutions, you are required to do so independently and away from your peers (in another room, preferably). You are also permitted to consult other textbooks and, in this case, please give full details (beyond what's in our textbook). If you work with peers or consult material outside the textbook, you are required to cite your sources (including naming the peers with whom you worked); failure to do so is a matter of academic dishonesty and will result in grade penalties and/or reports of academic negligence/dishonesty. Your solutions should communicate your individual process and understanding of the material. What you turn in must be your own.

The homework for this class will be a mix of proofs and computation-type exercises. For the proof-based exercises, in general, you are expected to follow the guidelines outlined in Math 274. Of

course, writing proofs is a difficult and monumental skill to master and we will work together to build and hone this skill. Please keep in mind the following guidelines while writing and polishing your proofs: 1) Correctness is essential. 2) The longest proof is never the best; the shortest proof is rarely good. 3) Clarity is the ideal.

For the computation-type exercises, as with your proofs, I expect your solutions to be written out correctly and presented in good mathematical prose. Your grade will depend on the correctness of your solutions and the quality of your writing. This means that your writing should follow a coherent logical structure which makes use of complete sentences and follows standard rules of grammar. Please do not submit solutions containing incoherent and unstructured calculations. You should be proud of the material you turn in!

Homework Structure and Schedule: Assignments will be posted to the course website and are to be submitted in class on their due date (which usually falls on a Friday). It is crucial to keep up with the homework in this course. Therefore, short of the circumstances discussed in the attendance policy above, late homework will not be not accepted. I will drop your lowest homework score on the condition that you attend one Mathematics/Statistics department colloquium and write a short (one paragraph) summary.

Homework Policies:

1. All write-ups are to be submitted in hard copy. They should be single-sided with no more than one problem per page, i.e., if a homework assignment has 5 problems, you should turn in at least 5 pieces of paper.

2. Each paper you turn in should have your name and the due date printed clearly at the top.

3. Your write-ups should be paper-clipped. You should staple all papers corresponding to a single exercise together, but please paper-clip (not staple) the group of exercises together. It is your responsibility to make sure that your homework is complete and all pages are accounted for.

Quizzes: We will have weekly quizzes administered at the beginning of class on Fridays. The quizzes will be limited to one or two problems each and they will parallel, in content and style, the problems seen in the homework. There are **no** make-up quizzes; I will however drop your lowest quiz score provided you attend one department colloquium **outside of mathematics/statistics** and write a short (one paragraph) summary.

My Email Policy: I love talking about mathematics and I always prefer to do it in person. For this reason, I like to, whenever possible, reserve email for logistical things. However, when you are stuck and cannot come see me in person, please feel free to email me. I am here to help!

As my life is busy and I have many responsibilities, I usually only check and respond to email once per day and sometimes not at all on weekends. For this reason, I try to uphold the following 24-48 hour rule: If you send an email Sunday through Thursday, I will do my best to respond within 24 hours. If you send an email on Friday or Saturday, I will do my best to respond within 48 hours. If I do not respond within these windows, feel free to email me again as I may have missed it.

Academic Integrity: Honesty, integrity, and personal responsibility are cornerstones of a Colby education and provide the foundation for scholarly inquiry, intellectual discourse, and an open and welcoming campus community. These values are articulated in the Colby Affirmation and are central to this course. You are expected to demonstrate academic honesty in all aspects of this course. If you are clear about course expectations, give credit to those whose work you rely on, and submit your best work, you are highly unlikely to commit an act of academic dishonesty.

Academic dishonesty includes, but is not limited to: violating clearly stated rules for taking an exam or completing homework; plagiarism (including material from sources without a citation and quotation marks around any borrowed words); claiming anothers work or a modification of anothers work as ones own; buying or attempting to buy papers or projects for a course; fabricating information or citations; knowingly assisting others in acts of academic dishonesty; misrepresentations to faculty within the context of a course; and submitting the same work, including an essay that you wrote, in more than one course without the permission of the instructors.

Academic dishonesty is a serious offense against the college. Sanctions for academic dishonesty are assigned by an academic review board and may include failure on the assignment, failure in the course, or suspension or expulsion from the College.

For more on recognizing and avoiding plagiarism, see the library guide at the following website: libguides.colby.edu/avoidingplagiarism

The Colby Affirmation

Colby College is a community dedicated to learning and committed to the growth and well-being of all its members.

As a community devoted to intellectual growth, we value academic integrity. We agree to take ownership of our academic work, to submit only work that is our own, to fully acknowledge the research and ideas of others in our work, and to abide by the instructions and regulations governing academic work established by the faculty.

As a community built on respect for ourselves, each other, and our physical environment, we recognize the diversity of people that have gathered here and that genuine inclusivity requires active, honest, and compassionate engagement with one another. We agree to respect each other, to honor community expectations, and to comply with college policies.

As a member of this community, I pledge to hold myself and others accountable to these values.