
Complex Analysis

Math 312 Spring 2014
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MWF 3:00-3:55pm Fowler 307
<http://faculty.oxy.edu/ron/math/312/14/>

INSTRUCTOR Ron Buckmire ~ Fowler 313 ~ x2536 ~ ron@oxy.edu

OFFICE HOURS I am almost always in my office (Fowler 313) until at least 5pm. My official office hours for Spring 2014 are **MWF130-230pm, 4-5pm, R 430-530pm**. You can make individual appointments at <http://ronbuckmire.youcanbook.me>

I am readily accessible by electronic mail at ron@oxy.edu and by phone at 323-259-2536. My Twitter handle is **MadProfessah** and my Google Chat name is **Mad-Professah**. If you need to see me at a time not specified here, do not hesitate to contact me and make an appointment and I'll be happy to meet with you. I think out-of-classroom student-faculty interactions are important. You are also strongly encouraged to visit me in office hours several times during the semester or chat with me whenever you have a question. If you don't interact with your professors individually you really aren't getting your money's worth at Occidental College! In addition, you should work together with your classmates to succeed together in the course.

TEXTBOOK *Complex Analysis (A First Course with Applications)*, by Dennis G. Zill and Patrick D. Shanahan, 3rd Edition (2013), Jones & Bartlett Learning.

SYLLABUS The official syllabus for this course is on the web at <http://faculty.oxy.edu/ron/math/312/14/syllabus.pdf>.

WEBSITE <http://faculty.oxy.edu/ron/math/312/14/>

GOALS AND OBJECTIVES The main goal of the course is for you to learn different aspects of complex analysis. I shall be teaching the course with an idea towards how complex variables are used to solve real-world or physical problems in other disciplines. Topics intended to be included in the course are: the complex plane, elementary and analytic functions of a complex variable, contour integration, conformal mapping, Laurent and Taylor series, and residues and their applications.

FORMAT OF THE CLASS I believe strongly in collaborative learning, active engagement and peer instruction. Collaborative learning means that students collaborate together to learn the material in the course. Active engagement by students means that you accept the responsibility for your own learning of the material and do not perceive the instructor (professor) as a source of all knowledge. Peer instruction is when students in the class learn from each other by explaining concepts and demonstrating their own understanding to others. These ideas are integral parts of my teaching philosophy. I hope that every single student will have met with me in my office *at least* once and probably several times, by the end of the semester. *Complex Analysis* is not a class that you should expect to "do well" on your own.

I also believe that students should be able to communicate the mathematics they are learning, in both written and oral form, to others. Thus, everyone in the class will have to give a (very short) oral presentation before the class detailing the answer to a

homework or quiz question at least once throughout the semester. In addition, you will probably be explaining details of the ideas in complex analysis to each other as you do the problem sets outside of class, and as we grapple with the concepts during class.

LEARNING OUTCOMES OF THE CLASS My primary learning outcome of the class is that you gain an appreciation for and dexterity with, complex variables. And to have fun doing it! Complex variables was my favorite class when I was an undergraduate, and I hope to make *Complex Analysis* yours. Specifically, by the end of the class you should feel comfortable

- manipulating complex numbers and functions of a complex variable as well as you manipulate real numbers and real functions
- solving algebraic equations containing complex variables
- differentiating and integrating functions of a complex variable
- constructing mappings from one 2-D region to another
- expanding functions of a complex variable as a Laurent Series
- using Residues to evaluate real (improper) integrals analytically

among other skills.

STUDENT PARTICIPATION I expect (a lot of) participation in class from every student in the class and will facilitate this through the use of daily class formats (worksheets), group work, in-class computer exercises, abbreviated lectures and online communication. In the past I have used classroom voting (where all students respond individually to questions posed to the entire class, often using personal response devices) and peer instruction (where students discuss the material with each other in order to collaboratively share their understanding of the material and foster student interactions). For Math 312 I am considering teaching some fraction of the class in an “inverted” or “flipped” style where the vast majority of time the student spends INSIDE the classroom is devoted towards solving problems and assessing understanding of the material and OUTSIDE the classroom the student spends their time to obtain their first exposure to the course content. Stay tuned!

TESTS There will be **three (3)** exams in this course. To be precise, two tests and a final exam. The tests are scheduled for

- TEST 1: Monday, March 3, 2014
- TEST 2: Monday, April 14, 2014
- FINAL : Tuesday, May 6, 2014 (6:30pm-9:30pm)

Of course, these dates are subject to change (with at least one week’s notice). It should be noted that students generally think that my tests are too hard. (This is primarily because I often assess students’ understanding of material by including questions which have the concepts in new contexts which they have not seen before.

QUIZZES There will be quizzes given every week. These quizzes will almost always be take-home, weekend quizzes given out on class on Friday to be handed in in class on Monday. They will consist of problems similar to the homework problems or concept questions in the textbook which you work on by yourself and will be a way in which you can assure yourself you are keeping up with the course.

HOMEWORK Homework should be done in **pencil**. Homework will be collected in **PROBLEM SETS** that will be due every week or so. You are **strongly** encouraged to work on the homework together. However, whatever you hand in must represent your own understanding of the material. Copying homework is cheating and will be dealt with accordingly. Homework is assigned for each class period, usually on the associated class worksheet.

TERM PROJECT I will provide more information about the term project later in the semester. It will probably consist of a 5-paged written presentation which describes some topic involving complex variables which is of interest to the student.

You could choose to write about a particular interesting question on a quiz or problem set, write a computer program or talk about an application of complex variables to some other field.

The point is to communicate your thoughts about and understanding of at least one topic related to complex variables. There are many examples of potential student project topics in the Applications section of every chapter of the textbook. There may be an option to convert the project into a 10-minute oral presentation with slides.

COURSE POLICIES This is a non-exhaustive list of my course policies:

- Make-up tests will not be given except for compelling reasons which have been communicated to me well-in advance (i.e. at least 7 days) of the test date.
- If you are late to a test, you will only be allowed the time remaining in which to complete your test.
- Late quizzes (or homework) will not be accepted under any condition since the solutions are made available on the same day that they are collected to be graded.

COLLEGE POLICIES Here are some official policies of Occidental College which you should be aware of

Disabilities: Accommodation of disability-related needs is available on request. Students with documented disabilities who are registered with Disability Services are required to present their accommodation verification card to the instructor at the beginning of each semester or as soon as possible thereafter. Students who experience significant physical or mental impairments can contact Disability Services at (323-259-)2969 to learn about available services and support.

Honest Academic Work: Shared commitment to ethical principles is essential to the educational purposes and fairness of the academic enterprise. Occidental College assumes that students and faculty will embrace a high ethical standard for academic work. Fundamental to academic ethics is a spirit of honor. A spirit of honor thrives when students challenge each other to attain the highest levels of scholarship, civility, and responsibility. For more information, see <http://www.oxy.edu/student-handbook/academic-ethics/academic-ethics>

Classroom Conduct: The goals of this course can only be accomplished in a setting of respect. Although the study of complex analysis rarely lends itself to too much controversy, we must still provide a safe environment that is conducive to learning. All are welcomed and encouraged to actively participate

in the learning of differential equations, regardless of gender, race, nationality, native language, sexual orientation, gender identity, political ideology, and especially personal mathematical history. Any student who feels she or he is experiencing a hostile environment should speak to me immediately.

Electronic Devices: Please remember that common courtesy dictates turning off all electronic devices and cell phones (or place in silent mode) before coming to class; these devices can be a distraction for other students (and me!) in the class and thus should not be in use during class time unless I give you explicit permission to do so.

GRADES Your course grade will be composed of the following:

- Two (2) Tests **20%**
- Final Exam **20%**
- Quizzes and Problem Sets **40%**
- Class Participation & Oral Presentation **10%**
- Term Project **10%**

ABSENCES We will not have class on Monday February 17 (Presidents Day), Wednesday March 5 (Buckmire absent), March 10-14 (Spring Break). I will let you know at least a week ahead of time if there may be other days class will be cancelled.

ON-LINE MATERIALS I have set up a web page for the course, where the official version of this syllabus and all class materials will be available. The URL is <http://faculty.oxy.edu/ron/math/312/14/>. Also there is a class mailing list, which all students are on, at math312-L@oxy.edu. I will endeavor to put records of grades course material on Moodle.