MAT 572 - Complex Analysis, Fall 2019

Instructor

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Course Description

Catalog Description. Analytic functions, series and product representations, entire and meromorphic functions, normal families, Riemann mapping theorem, harmonic functions, and Riemann surfaces.

Depending on time, some of the more advanced topics such as the Riemann Mapping Theorem, will be covered in the sequel course, MAT 573.

Complex analysis is the study of functions defined on the complex plane. The course starts with the definition of an analytic function or equivalently, a complex differentiable function. There is a parallel between the definition of a complex differentiable function and the definition of a differentiable function on the real line. However, the behavior of complex differentiable functions is quite different from the behavior of differentiable functions in the real variable sense. For example, analytic functions must also satisfy a system of partial differential equations called the *Cauchy-Riemann equations*. Analytic functions are also representable by a power series.

This course examines the properties and behavior of analytic functions and how they differ from differentiable functions in real-variable theory. Connections with partial differential equations (harmonic functions and Laplace's equation) and geometry (conformal mapping) along with applications will be examined as well.

Prerequisites

No formal knowledge of complex analysis or analytic functions will be assumed. You should know basic facts about advanced calculus and real analysis. From advanced calculus, we'll make use of line integrals and Green's Theorem in the two dimensional plane. These concepts will be quickly reviewed. From real analysis, you should be comfortable with convergent sequences of real numbers and convergent sequences of continuous functions (both pointwise and uniform convergence). The ASU course which covers such material is MAT 371, but these concepts will also be quickly reviewed. You should also be comfortable with the concept of mathematical proof and know how to construct proofs that start with the given information and reach the desired conclusion after a sequence of clear logical steps.

Text

The required text for this course is *Complex Analysis, 3rd Edition* by Joseph Bak and Donald Newman (Springer - ISBN 978-1-4419-7288-0) We will cover the material in chapters 1-11 and parts of chapters 12, 13, and 14 as time permits. My presentation and technique will sometimes differ from that of the text since I believe it is important for you to see two different points of view on some topics.

Grading

Grades will be determined by problem sets, one midterm exam and a final exam. The grade weights are as follows.

HW Problem Sets	Midterm	Final Exam
30%	30%	40%

The midterm and final exam will be in-class exams and you will be required to do your own work without help from others or the ability to consult with any references or notes. Tentative date for the midterm is just before fall break. The final exam will be scheduled by the Registrar. You may consult with each other on homework problem sets, BUT only submit work which is in your own words AND be sure to cite any sources of help (either texts or people). Homework problems will be of two types - more routine ones, which will be assigned and not graded; more important and substantial problems which will be collected and graded. Many of these problems will require proofs; others will be more computational. The clarity of your presentation will be graded along with the correctness of your mathematics. Electronic submission of homework as a PDF document through the Moodle Course Management System is required. More details on accessing the Moodle page will be available closer to the beginning of the fall term. Homework should be typed (TeX) or *very* neatly handwritten and then scanned as a PDF. As part of your HW problem set grade, you may be required to present an occasional problem at the board in front of the rest of the class.

In compliance with the Rehabilitation Act of 1973, Section 504, and the Americans with Disabilities Act of 1990, professional disability specialists and support staff at the Disability Resource Center (DRC) facilitate a comprehensive range of academic support services and accommodations for qualified students with disabilities. For more information, please contact the DRC at 480-965-1234 and/or visit their webpage at http://www.asu.edu/studentaffairs/ed/drc/.