

Complex Variables

Spring 2012

Course no. 4361.010
Time TR 12:30
Location MCS 216
Instructor Trey Smith
Office MCS 220L
Office Hours MWF: 10:00-11:00, 1:00-2:00
TR: 11:00-12:00, 2:00-3:00
Others by Appointment
Phone (325) 942.2100 ext. 235
Email trey.smith@angelo.edu
Web <http://www.angelo.edu/faculty/tsmith/>
Fax (325) 942.2503

Honor Code Angelo State University expects its students to maintain complete honesty and integrity in their academic pursuits. Students are responsible for understanding the Academic Honor Code, which is available on the web at <http://www.angelo.edu/forms/pdf/honorcode5.pdf>.

Accommodation Statement

Persons with disabilities which may warrant academic accommodations must contact the Student Life Office, Room 112 University Center, in order to request such accommodations prior to any accommodations being implemented. You are encouraged to make this request early in the semester so that appropriate arrangements can be made.

Religious Holidays

A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code 11.20. A student absent from classes for the observance of a religious holy day shall be allowed to complete work scheduled for that day within a reasonable amount of time as set out by the instructor.

Grading Your grade will be determined using three tests worth 30 points each and a homework grade worth 10 points.

Attendance Regular class attendance is expected. There will be no make-up for missed homework, so a missed day may result in a zero.

Calculators Calculators will not be allowed on any exams.

Course Outline

This is a tentative test schedule. I reserve the right to change the test dates and/or material.

1. Complex Numbers
2. Powers and Roots
3. Functions

4. Limits and Continuity
5. Derivatives
6. Cauchy-Reimann
7. Analytic Functions
8. Harmonic Functions
9. Review
10. **Test 1 (2.16)**
11. Exponential Functions
12. Logarithms
13. Trigonometric Functions
14. Inverse Trig Functions
15. Definite Integrals
16. Contours
17. Branch Cuts and Antiderivatives
18. Cauchy-Goursat
19. Review
20. **Test 2 (3.29)**
21. Connected Domains
22. Cauchy Integral Formula
23. The Fundamental Theorem of Algebra
24. Series
25. Series
26. Residues and Poles
27. Residues and Poles
28. Residues and Poles
29. Residues and Poles
30. Review
31. **Final Exam (5.10, 10:30-12:30)**

Student Learning Outcomes

- 1. The students will demonstrate factual knowledge including mathematical notation and terminology used in this course.** Students will read, interpret, and use the vocabulary, symbolism and basic definitions used in complex analysis.
- 2. The students will describe the fundamental principles including the laws and theorems arising from the concepts covered in this course.** Students will develop and apply the theorems about and the characteristics of complex numbers and functions defined on the complex numbers.
- 3. The students will apply course material along with techniques and procedures covered in this course to solve problems.** Students will apply theorems and results from this class to solve complex variable problems as well as related problems in other areas of mathematics including analysis and topology.

4. The students will develop specific skills, competencies and thought processes sufficient to support further study or work in this or related fields. Students will acquire the skills related to the study of complex variables including integration and differentiation techniques and the results associated to these ideas.

Course Content

Textbook: *Complex Variables and Applications*, by Ruel V. Churchill and James Ward Brown, McGraw Hill

- 1. Complex Numbers:** definition and properties, geometric interpretation, polar form, powers and roots, regions in the complex plane
- 2. Analytic Functions:** functions, mappings, limits, derivatives, Cauchy-Riemann equations, analytic Functions, harmonic Functions
- 3. Elementary Functions:** exponential functions, complex exponents, trigonometric functions, hyperbolic functions, logarithmic function and branches
- 4. Integrals:** antiderivatives, contours and contour integrals, Cauchy integral formula, simply and multiply connected domains, derivatives of analytic functions, The Fundamental Theorem of Algebra, Maximum Modulus Principle
- 5. Series:** Taylor and Laurent series, general properties of infinite series
- 6. Residues and Poles:** residue theorem, zeros and poles of order m , singularities
- 7. Applications of Residues:** evaluation of improper integrals, branch points and branch cuts
- 8. Mappings:** linear transformations, linear fractional transformations, mappings of the upper half-plane