Mathematics 326
Complex Analysis
Spring 2008 (TuTh 10:40-11:55am, MG 120)

Instructor: Dr. Grady Wright **Phone:** 426-4674
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Office Hours: MTuW 1:35-3:00pm, or by appointment

Text: J. Brown and R. Churchhill, *Complex Variables with Applications,* 7th edition, McGraw Hill, 2004

Course webpage: **http://math.boisestate.edu/~wright/courses/m326/**

Course description: We discuss the algebra of complex numbers, elementary functions of complex arguments, the theory of analytic functions, the Taylor and Laurent expansion of a function, integration in the complex plane, and conformal mappings with applications to electrostatics, heat, and fluid flow.

Prerequisites: No previous experience in complex variables is necessary. However, knowledge of the following topics is required:

- Single and multivariable calculus

Homework: Homework is assigned on a weekly basis and is posted on the course webpage on Thursdays or Fridays and is due the following Thursday **at the beginning of class.** Late homework is accepted up to 5 days after the due date for half the credit. Your submitted homework should show all necessary work you used to solve the problems; mathematical statements should be complete (or nearly complete) sentences; and the reasoning and logic underlying all arguments should be clearly spelled out. Please see the sheet "How to Present your Work" on the course web page for tips on meeting these requirements. **Failure to adhere to the above requirements may result in a loss of points.**

Collaboration: Collaboration is part of the real world and therefore permitted for all homework assignments, BUT NOT EXAMS. However, **each student is responsible for turning in their own written solutions to the problems.** Straight copying of another students work will result in a zero on that assignment for all parties involved.

Technology: A calculator is not required for the course, although it may be useful for some of the homework problems. You may find it helpful to use computer algebra software such as *Maple* and *Mathematica* to simplify some of the messy computations involved on the homework. However, on the work you turn in, it should be obvious how you could have obtained the result by hand. No software packages will be allowed on exams.

Grading policy: The breakdown for the final course grade is as follows:

- Homework: 30%
- Midterm 1: 15%
- Midterm 2: 15%
- Final Exam (Tuesday May 13, 2008 10:30am-12:30pm): 40%

Your grade will be determine from the standard percentages.

Important dates:

- **Feb. 4** – last day to register; add classes; change from credit to audit or audit to credit; and last day to drop classes without a "W" and receive a refund.
- **Mar. 3 –** last day to drop classes or completely withdraw.
- **May 9** – Classes end
- **May 13** – Final exam, 10:30am-12:30pm

Academic honesty: All students are expected to be familiar with and adhere to the policies and standards given in the BSU Student Code of Conduct (http://www2.boisestate.edu/studentconduct/Student%20Code%20of%20Conduct.htm)

Learning objectives: The learning objectives for this course set down by the Department of Mathematics are the following:

- Extending their skills in elementary calculus to the complex plane.
- Finding Taylors and Laurent series for complex functions.
- Using the topology of the complex plane to determine limits of sequences and series of complex valued function.
- Applying complex residue theory to integration of real valued functions over the real line.

Course outline: We will try and cover the following material (in roughly this order):

Section	**Topic**
1—3	Complex numbers
4—7	Geometric properties
8—9	Roots
10	Regions
11—13	Mappings
14—16	Limits
17—19	Derivatives
20—27	Cauchy-Riemann equations
29—32	Logarithms
28, 33—35	Exponential/trigonometric functions
36—41	Contour integrals
42—43	Antiderivatives
44—46	Cauchy-Goursat theorem
47—48	Cauchy integral formula
49—50	Liouville's theorem
51—54	Algebra and series
55—61	Laurent series
62—64	Residues

Section	Topic
65—70	Poles
71—74,78	Evaluating integrals
75—77	Indented paths
79—80	Argument principle
81—82	Inverse Laplace transform
83—88	Linear fractional transform
89—93	Mapping by logarithms, roots, etc.
94—97	Conformal mappings
98—99	Harmonic functions
100—103	Steady temperatures
104—105	Electrostatics
106—108	Fluid flow

Other good reading:

- Ablowitz & Fokas, *Complex Variables, Introduction and Applications* (Cambridge University Press)

The complexity of complex variables is more imaginary than real. –An encouraging observation

The number you have dialed is imaginary. Please rotate your phone 90 degrees and try again. –A math joke

The shortest path between two truths in the real domain passes through the complex domain. –Jacques Hadamard