

**Math 4150/6150 fall 2009, Syllabus. Roy Smith, Boyd 448, 542-2595, [roy@math.uga.edu](mailto:roy@math.uga.edu), [rsmith99@gmail.com](mailto:rsmith99@gmail.com), office: 11:15-12noon MWF, and by appointment, (email me to arrange it). I enjoy meeting with students.**  
Prerequisites include: math 3100 and 2500 (series, path integrals, Green's theorem).

Welcome to math 4150/6150, complex analysis. We ask what happens if differentiable functions have complex values both in the domain and range. The short answer: it allows us to solve problems which are much more difficult otherwise (I once heard a talk by Steven Hawking where he said he obtained good results by allowing *time* to have complex values in his formulas! It blew my mind that I had not thought of it.)

There are three (theoretical) aspects to the subject, which can be studied in any order!  
1) elementary geometry of the complex plane and of complex mappings (key result: open mapping theorem), Lang chap. VII;  
2) path integration of complex differentiable functions (key result: Cauchy Integral theorem, i.e. Green's theorem), Lang chap. III.  
3) expansion of complex differentiable functions in power series (key result: principle of isolated zeroes, or "analytic continuation"), Lang chap. II.

Two required books: Lang, Complex Analysis (UGA bookstore \$27), a beautifully clear and succinct account of the theory; Greenleaf, Complex variables (at Baxter Street Books \$37), a lovingly detailed account with many examples, prerequisites, and applications. Lang makes it sound simple, and Greenleaf gives you enough examples and background knowledge to grasp the subject firmly. I hope they compliment each other. I chose them because they are good and relatively cheap.

Other good cheap books: Cartan, Elementary theory of analytic functions; Knopp, Theory of functions 2vols; Hille, Analytic function theory, 2 vols.

We will follow Lang, and use Greenleaf for background and extra detail. We will try to cover chapters I-VII of Lang probably omitting IV, a little over 200 pages. This corresponds roughly to chapters I-VI of Greenleaf, about 400 pages, so you see how much more detail is in Greenleaf.

We will have three tests and one final, and regular homework, with your grade guaranteed to be no lower than 60% tests, 15% hw, 25% final. I will communicate by email, so check yours daily, and keep your mailbox from filling up. Students in 6150 will have some more advanced homework assignments.

Test dates are tentative and required, so do not plan a vacation near one. The final exam will not be moved so check for conflicts now. Attendance is required: three or more unexcused absences may result in a W or WF.

Tests: I-Sept. 14, 2009; II-Oct. 12, 2009; III-Nov. 16, 2009. Exam: Dec. 14, 2009, noon.

This is a tentative course plan, deviations may be necessary. We will follow the UGA academic honesty policy as it appears on the web.