Mathematics 3146

Introduction to Complex Variables

Spring, 2009

(In case you were planning to become a lumberjack, The Wall Street Journal might have some advice for you.)

Instructor: Bill Abikoff

Text: Brown and Churchill, *Complex Variables and Applications*, Eighth Edition. The publisher is McGraw-Hill and the ISBN is 0073051942.

Meeting times: TuTh 9:30 - 10:45 PM in MSB 407 (Math Sciences Building)

The course covers the standard contents of a basic complex variables course. Complex numbers arose as curious solutions of equations having no real solutions and have only been considered acceptable for about 200 years. Differential and integral calculus, using complex numbers, is one of the most powerful mathematical techniques --- both in theory and in application. This course focuses on ideas and calculations using complex functions.

Here is the link to my personal home page. There is a link to the Math Department listing of instructor contact information, including office hours, both here and on my home page. I'll try to keep you informed if, for any reason, I cannot be available at the committed time.

This is a link to a list of the Homework assignments. Others may be assigned in class.

The remainder of this page is a tentative syllabus --- it may be a bit ambitious. We'll see how it goes.

Complex numbers: z=x+iy, vector representation, conjugates, triangle inequality,

Re z, Im z, |z|, arg z, Arg z,

polar coordinates

Euler's formula

products/quotients/conjugates in polar coordinates

roots

limits

infinite limits/limits at infinity

continuity

analytic and harmonic functions

Cauchy-Riemann equations, finding a harmonic conjugate, conformality

elementary functions: exp, sin, cos, log, Log, powers

dt integral

contours

contour integral (dz integral)

antiderivative and related theorems

simply connected domain and related theorems

Cauchy-Goursat or Cauchy's theorem

Cauchy's integral formula for f(z) and its derivatives

Taylor series, absolute and uniform convergence

Laurent series, integral formula for coefficients

residues, Cauchy's Residue theorem

classification of isolated singularities, order of poles and zeros, residues at poles

application of residues to definite real-valued integrals