Math 506 Complex Analysis
Xi Chen
Winter, 2010

Topics to cover:

Single complex variables: Cauchy-Riemann equation and analyticity; Cauchy integral theorem; Maximum Modulus principle; Laurent series and singularities; Riemann extension theorem; Residues; Schwartz's lemma; Open mapping theorem; Analytic continuation and Riemann zeta function; Normal families and Montel's theorem; Riemann mapping theorem; Picard theorems.
Several complex variables and introduction to complex manifolds: Analyticity in several complex variables; Weierstrass preparation theorem; Hartog's theorem; Riemann extension theorem; Weiestrass division theorem; Analytic Nullstellensatz; Implicit and inverse function theorems; Complex manifolds; Holomorphic maps of complex manifolds; Complex hyperbolicity; Projective spaces; Riemann surfaces; Elliptic curves and Weiestrass doubly periodic functions.

References:

1. John B. Conway: Functions of One Complex variables, GTM 11
2. Serge Lang, Complex Analysis.
3. H. Farkas, I. Kra, Riemann Surfaces, GTM 71.
4. H. Grauert, K. Fritzsche, Several Complex Variables, GTM 38.

Grading: Midterm exam (40%) Final exam (60%); Homework is optional and some exam problems will come from homework.
Notes, homework assignments and other course materials are available at http://www.math.ualberta.ca/~xichen/math50610w/

University of Alberta
Department of Mathematical and Statistical Sciences

November 16, 2009

Background material for Math 506

- An undergraduate course in complex analysis
- Real analysis
- Basic notions in algebraic topology (homotopy, fundamental groups, homology)
- Basic notions in algebra (groups, rings, modules, fields)
- Basic notions in differential geometry (differential forms, Stokes' theorem)

References

We recommend the following textbooks to learn this background material:

- W. Rudin, *Real and Complex Analysis*.
- R. Bott and L.W. Tu, *Differential Forms in Algebraic Topology*.
- S. Lang, *Algebra*.