Professor Carl Cowen **Math 53000** **Spring 2014**

OUTLINE from February 18 to April 8

- Cauchy's Theorem and Integral Formula
  - Versions for various domains and contours
  - Integral formulas for coefficients in Taylor and Laurent series
- Residue Theorem and Contour Integrals
  - Definition of residue
  - Evaluation of real definite integrals via contour integration
- Definition of multiplicity of a zero of a holomorphic function
- Liouville's Theorem
- Fundamental Theorem of Algebra
- Zero sets of holomorphic functions
  - Conditions on zero sets of f that imply $f \equiv 0$
  - Conditions that imply $f \equiv g$
- Maximum Modulus Theorem
- Schwarz's Lemma
- Uniform convergence on compact subsets
  - Weierstrass' Convergence Theorem
- Winding numbers, index
- Independence of path
- Laurent series and singularities of holomorphic functions
  - Classification of isolated singularities as removable, poles, essential
- Runge's Approximation Theorem
- Open Mapping Theorem