

Topics for Final

MATH 420

- Basics
 - algebraic operations, complex conjugate, modulus and argument of a complex number z
 - Polar form of a complex number z , de Moivre's Formula, finding **powers** and **roots** of z
- Functions of a complex variable: $f(z) = u(x, y) + iv(x, y)$
 - Analyticity and the Cauchy-Riemann equations
- Elementary functions: Euler's formula, $w = e^z$, $z = \log(w)$, $\sin z$, $\cos z$, principal branch of the logarithm, other multi-valued functions and principal branches of such functions
- Line/Contour Integrals
 - Parameterize a given curve C
 - Evaluate the integral of a given function f on C .
 - Properties of contour integrals
- Cauchy's Integral Theorem and its consequences
- Cauchy's Integral Formula and existence of derivatives of all order
- Theorems related to Cauchy's Integral Formula (Cauchy's Estimate, Liouville's Theorem, Fundamental Theorem of Algebra, Gauss Mean Value Theorem, Maximum Modulus/Minimum Modulus Theorem)
- Infinite series and region of convergence
 - Taylor series, Maclaurin series
 - Laurent Series
- Classification of singularities - isolated, non-isolated, removable, pole, essential

- Definition of residue, calculating residues and the Residue Theorem
- Evaluating definite integrals using Residue Theorem
- Conformal mapping - results on analytic functions and harmonic functions
- Solving boundary value problems - Dirichlet problem for the Laplace Equation
- Be familiar with all the HW problems, examples solved in class and problems suggested as practice problems for Midterm I, II and Final