California State University – Los Angeles
Department of Mathematics and Computer Science

Syllabus for the
Master’s Degree Comprehensive Examination

Fall 1984
(Retyped June 1995, Hoffman)
(Retyped April 2000, Hoffman)

Topics

1. Algebra and geometry of complex numbers
2. Mapping properties of elementary functions. (exponential, powers, trigonometric functions, linear fractional (Möbius) transformations, branching of logarithm and roots)
3. Analyticity and the Cauchy-Riemann equations.
4. Cauchy theorem and the Cauchy integral formulas
5. Relationship to harmonic functions: Harmonic conjugates, Dirichlet problem
6. Understand and apply convergence theory for analytic and harmonic functions.
7. Series expansions of Taylor and Laurent (manipulation, convergence, regions of convergence, etc.)
8. Classification and behavior of singularities.
9. Residues and applications to definite integrals, including improper real integrals, and series
10. Theoretical considerations:
   (1) Casorati-Weierstrass theorem
   (2) Cauchy estimates
   (3) Liouville’s theorem about entire functions
   (4) Maximum modulus principle
   (5) Schwarz’ lemma
   (6) Identity theorem and analytic continuation
   (7) Morera’s theorem
   (8) “Principle of the argument”, root counting formula, Rouche’s theorem


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References


