MAT 542: COMPLEX ANALYSIS I
OFFICIAL SYLLBUS

(1) The field of complex numbers, geometric representation of complex numbers
(2) Analytic functions
   • Definition, Cauchy-Riemann equations
   • Elementary theory of power series, uniform convergence
   • Elementary functions: rational, exponential and trigonometric functions
   • The logarithm
(3) Analytic functions as mappings
   • Conformality
   • Linear fractional transformations
   • Elementary conformal mappings
(4) Complex integration
   • Line integrals and Cauchy’s theorem for disk and rectangle
   • Cauchy’s integral formula
   • Cauchy’s inequalities
   • Morera’s theorem, Liouville’s theorem and fundamental theorem of algebra
   • The general form of Cauchy’s theorem
(5) Local properties of analytic functions
   • Removable singularities, Taylor’s theorem
   • Zeros and poles, classification of isolated singularities
   • The local mapping theorem
   • The maximum modulus principle, Schwarz’s lemma
(6) The calculus of residues
   • The residue theorem
   • The argument principle
   • Rouche’s theorem
   • Evaluation of definite integrals
(7) Power series
   • Weierstrass theorem
   • The Taylor and Laurent series
   • Partial fractions and infinite products
   • Normal families
(8) The Riemann mapping theorem
(9) Harmonic functions
   • The mean-value property
   • Harnack’s inequality
   • The Dirichlet problem
REFERENCES


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