Complex Analysis

Analytic functions

Complex differentation and the Cauchy-Riemann equations. Examples. Conformal mappings. Informal discussion of branch points, examples of $\log z$ and z^α.

Contour integration and Cauchy's theorem

Contour integration (for piecewise continuously differentiable curves). Statement and proof of Cauchy theorem for star domains. Cauchy's integral formula, maximum modulus theorem, Liouville theorem, fundmental theorem of algebra. Morera's theorem.

Expansions and singularities

Uniform convergence of analytic functions; local uniform convergence. Differentiability of a power series. Taylor and Laurent expansions. Principle of isolated zeros. Residue at an isolated singularity. Classification of isolated singularities.

The residue theorem

Winding numbers. Residue theorem. Jordan Lemma. Evaluation of definite integrals by contour ~~integral~~ integration. Rouché theorem, principle of the argument. Open mapping theorem.

Appropriate books

L.V Ahlfors Complex Analysis McGraw-Hill 1978

† A.F Beardon Complex Analysis Wiley

D.J.H Garling A Course in mathematical Analysis (vol 3) CUP 2014

† H.A Priestly Introduction to Complex Analysis OUP 2003

I. Steward and D. Tall Complex Analysis CUP 1983