

# SYLLABUS FOR THE COMPLEX ANALYSIS QUALIFYING EXAM

STANFORD UNIVERSITY MATHEMATICS DEPARTMENT

**Elementary properties of analytic functions:** Cauchy-Riemann equations; the elementary analytic functions; analytic functions and conformal mappings; the elementary conformal mappings; power series and Laurent series; isolated singularities.

**Complex integration:** the Cauchy theorem; the Cauchy integral formula; calculus of residues; contour integration; evaluation of definite integrals.

**Further properties of analytic functions:** Liouville's theorem; Morera's theorem; classification of isolated singularities; the maximum principle; the Schwartz lemma; the Phragmen-Lindelof theorem; the argument principle and Rouché's theorem; the reflection principle; the Schwarz-Christoffel formula; Runge's theorem.

**Entire functions and meromorphic functions:** infinite products; canonical products and the Weierstrass factorization theorem; the Mittag-Leffler theorem; elementary properties of elliptic functions; Picard's theorem; the Riemann Zeta function.

**Extremum problems:** uniform convergence of analytic functions; normal families; Riemann mapping theorem.

**Multiple-valued functions:** analytic continuation; homotopy of curves; monodromy theorem; Riemann surface of an analytic function.

**Harmonic functions** the Poisson integral; the mean value property; the maximum principle; Harnack's inequality; the Dirichlet problem.

## REFERENCES

L. Ahlfors, *Complex Analysis*.

J. Conway, *Functions of one complex variable*.