Complex Analysis (Analisi Complessa)

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Mathematics Second Level Course

It is open to students of the **Master's degree in Mathematics (Laurea Specialistica)**, and to students of the **Master Mundus ALGANT program**.

When: second trimester

Where: Department of Pure and Applied Maths, Padova.

Number of credits: 4

Examination: oral.

Description of the course

This is a second course on functions of one complex variable. Students are supposed to be familiar with the arguments listed below.

Prerequisites

Cauchy–Riemann identities and complex differentiation; holomorphic functions. Line integrals of complex functions and their homotopy invariance. Logarithm of a path and winding number. Cauchy formula for a circle. Analiticity of holomorphic functions. Zero–set of a holomorphic function; the identity theorem. Maximum modulus theorem. Laurent series and isolated singularities. Residue theorem, and its use for the computation of integrals. Argument principle. Open mapping theorem.

Program

Applications of the maximum modulus theorem: three lines and three circles theorem; Phragmen–Lindelöf method; Schwarz's lemma and holomorphic automorphisms of the unit disc.

Topology of uniform convergence on compacta; compact sets of holomorphic mappings and Montel's theorem. Riemann mapping theorem.

Infinite products and Weierstrass factorization theorem. Euler's Gamma function as an infinite product and as an integral. Riemann's zeta function and relations to the Gamma function.

Approximation with rational functions; Runge's theorem. Simple connectedness. Mittag–Leffler's theorem.

References

1) J. B. Conway, *Functions of One Complex Variable*, Second edition, Springer, 1978.

2) R. Remmert, *Theory of Complex Functions*, Springer, 1991.

3) R. Remmert, *Classical Topics in Complex Function Theory*, Springer 1998.