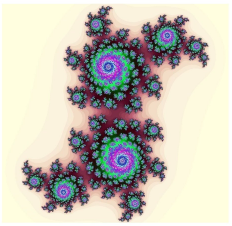
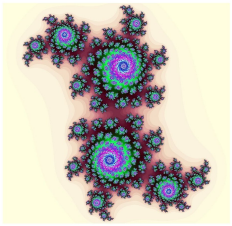


Introduction to 1-d complex dynamics



Miriam Anna Benini

One dimensional complex dynamics is the branch of dynamical systems which studies the iteration of holomorphic functions on the complex plane. This course is an introduction to the techniques and main results proper to this field. Our focus will be on polynomial and transcendental maps; during the course we will also present several open problems. The reader is assumed to know about holomorphic functions and their basic properties.

Syllabus

- Introduction to holomorphic dynamics and presentation of the main problems in this field.
- Montel's theorem, stable and unstable dynamics, Fatou and Julia set. Classification of fixed points and local dynamics near fixed points. Properties of the Julia set.
- Riemann's Uniformization theorem and classification of stable domains: attracting basins, parabolic basins, Siegel disks, Herman Rings, Wandering domains and Baker domains.
- Dynamic rays and symbolic dynamics for polynomials, ray portraits, local connectivity. Structural stability and bifurcation locus, the Mandelbrot set, the Rigidity conjecture and MLC.
- Dynamic rays and parameter space for the exponential family. Landing of rays and accessibility of periodic points.
- Structure of the dynamical plane for transcendental maps with bounded set of singular values. Dynamic rays and symbolic dynamics for transcendental maps.
- Various kinds of parameters revisited: parabolic, hyperbolic, indifferent parameters in relation with the parameter plane.
- Open problems and discussions.

Bibliography

A. Douady, J.H. Hubbard, *Etude dynamique des polynômes complexes*, PrePublication Mathematiques d' Orsay, 84-02 and 85-04.

J. Milnor, *Dynamics in one complex variable*, Annals of Mathematics Studies (2006), Princeton University Press.

R. Devaney, *An Introduction to Chaotic Dynamical Systems*, 2nd Edition (2003), Westview Press.

Prerequisites

It is assumed a standard course in complex analysis covering holomorphic maps and their basic properties.