

Title: Contour methods in the mathematical theory of phase transitions

Author: Oliver Nagy

Department: Department of Mathematical Analysis

Supervisor: doc. RNDr. Miloš Zahradník, CSc.,
Department of Mathematical Analysis

Abstract: This thesis concerns itself with three topics, namely polymer models, Pirogov–Sinai theory and one-dimensional Dyson models. It contains a short introduction into all three topics. The introduction to Pirogov–Sinai theory will serve as a starting point for a future expanded introductory exposition, since such a material is missing in the contemporary literature. Research result of the first chapter is a detailed combinatorial analysis of cluster expansion of hard-core repulsive polymer model based on ‘self-avoiding polymer trees’, leading to simplification of the structure of summation in the partition function. In the case of Dyson models we suggest an alternative definition of contours for the one-dimensional Dyson model with the exponent of polynomially-decaying interaction $p \in (1, 2)$ that is usable for study using Pirogov–Sinai methods.

Keywords: Contours, polymers, cluster expansion, Pirogov–Sinai theory, Dyson model;