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Interfaces in the Potts Model II: Antonov's Rule and Rigidity of the Order Disorder Interface

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Abstract. Within the ferromagnetic q-state Potts model we discuss the wetting of the interface between two ordered phases a and b by the disordered phase f at the transition temperature. In two or more dimensions and for q large we establish the validity of the Antonov's rule, $\sigma^{ab} = \sigma^{af} + \sigma^{fb}$, where σ denotes the surface tension between the considered phases. We also prove that at this temperature, in three or more dimensions the interface between any ordered phase and the disordered one is rigid.

1. Introduction

In recent years considerable progress has been achieved on the study of the physical properties of the interfaces between two coexisting phases. When three or more phases coexist new physical phenomena appear whose understanding requires the study of several interacting interfaces.

A simple model in which this situation occurs in the ferromagnetic q-state Potts model in dimension $d \geqq 2$. This model exhibits q ordered phases at low temperatures and one disordered phase at high temperatures. For q large enough, the order-disorder transition is first order, and all the previous phases coexist and are distinct at some unique transition inverse temperature β_t. For rigorous results, see [1–6].

In the first part of this work [6] we have presented an analysis of the order-disorder transition for large q based on an adaptation of the theory of Pirogov and Sinaï to the Fortuin–Kasteleyn representation of the Potts model. In the present paper we develop this approach, and apply it to study the behaviour

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