Phase Transitions and Critical Phenomena

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Exercise Sheet 1

HS 14
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Problem 1 Equivalence of models

Consider the *ferromagnetic* and the *antiferromagnetic* Ising model in 2D on a square lattice with the nearest neighbour interaction $J_{ij} > 0$ in zero field

$$\mathcal{H}_{\substack{F \\ (AF)}} = \sum_{\langle i,j \rangle}^{-}_{(+)} J_{ij} S_i S_j. \tag{1}$$

Show that the critical temperatures of these two models are identical!

Problem 2 Magnetic models in 2D

Show that the arguments presented in the lecture regarding domain walls and phase transitions for 2D Ising model do not work for the 2D XY and 2D Heisenberg model.