Statistical Physics II Home examination 2011

VI. HIGH-TEMPERATURE EXPANSION

Problem 6 out of 6

Do a high-temperature expansion for the Ising model in one dimension according to the methods of Chapter 6.2, and find the spin-spin correlation function,

$$\Gamma_{0j} = \langle \sigma_0 \sigma_j \rangle - \langle \sigma_0 \rangle \langle \sigma_j \rangle, \tag{1}$$

to fourth order in the inverse temperature. Fit this function to an exponential,

$$\Gamma_{0j} \propto e^{-j/\xi}, \tag{2}$$

and find the correlation length ξ.

Hint 1: Is the second term in Eq. (1) zero?

Hint 2: The book already did major parts of the calculation for you.

Hint 3: You will probably have to consider each point in space, Γ_{01}, Γ_{02}, Γ_{03} etc., separately.