Statistical Physics 2, 7.5 hp Home examination

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III. SCALING RELATIONS

Problem 3 out of 3

Consider a magnetic system at $T = T_C$ (that is, $t = 0$). As the external field h goes to zero we expect the correlation length to diverge with a critical exponent ν_H,

$$\xi(0, h) \sim |h|^{-\nu_H},$$

and furthermore we make the ansatz for the correlation function

$$g(r, t = 0, h) \sim \frac{1}{r^{d-2+\eta_H}} e^{-r/\xi}.$$

Finally we assume that the susceptibility diverges for vanishing h with an exponent γ_H, that is,

$$\chi(0, h) \sim |h|^{-\gamma_H}.$$

(a) Express γ_H in terms of ν_H, d, and η_H.

(b) Using the scaling ansatz (6.86) in the book, derive the scaling relation $\gamma_H \delta = \gamma/\beta$.

Hint: Compute the susceptibility using the ansatz for the correlation function.

Deadline Monday 23/5. *Submissions by pdf file to lundh@tp.umu.se or neat handwriting.*