

Physics 220: Problem Set 2
due April 24, 2012.

1. Show that the longitudinal susceptibility, $\chi_l = \partial \langle S_n^x \rangle / \partial h_\perp$, of the 1d transverse field Ising chain has a logarithmic divergence at the quantum critical point.
2. For the 3d Ising model (or the 2d quantum transverse field Ising model), the critical point is described by a scale invariant field theory with an “energy density” operator ε and a spin operator σ , just as in 2d (1d quantum), but with $d_\varepsilon = 1.59$ and $d_\sigma = 0.52$. Find the specific heat exponent α , the order parameter exponent β , and the correlation length exponent ν .