

Physics 7653: Statistical Physics
<http://www.physics.cornell.edu/sethna/teaching/653/>
Material for Week 6
Exercises due Tuesday Oct 2
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Pre-class Preparation

Thursday

Read: Cardy, Chapter 4 (Phase diagrams and fixed points), sections 4.2 (Cross-over behavior), 4.4 (Finite-size scaling), and 4.5 (Quantum critical behavior).

Crossover scaling and high T_c . One of the most interesting theories of high-temperature superconductors is that they are due to an underlying quantum critical point. A remarkable number of them share a phase diagram where the superconducting ‘dome’ separates a Fermi liquid phase and an antiferromagnetic phase, with weird behavior seen in a region much like that shown in Cardy’s figure 4.5. This weird behavior in the ‘classical’ region is usually called the ‘pseudogap’, although it is also characterized by several other properties.

Find a picture of this phase diagram, and a discussion about the relation with quantum criticality. Give the reference; was it accessible?

Submit electronically by 8:30 Thursday morning.

Tuesday

Read: Cardy, Chapter 4 (Phase diagrams and fixed points), section 4.1 (Ising model with vacancies).

Exercises

Cardy, exercise 4.4 (Crossover for an Ising slab)

12.4 Bifurcation theory.

12.8 Superconductivity and the renormalization group.