

Physics 7653: Statistical Physics
<http://www.physics.cornell.edu/sethna/teaching/653/>
Material for Week 8
Exercises due Tuesday Oct 23
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Pre-class Preparation

Thursday

Read: *Renormalization group and normal form theory*, Archishman Raju, Colin B. Clement, Lorien X. Hayden, Jaron P. Kent-Dobias, Danilo B. Liarte, D. Zeb Rocklin and James P. Sethna, <http://arxiv.org/abs/1706.00137>.

The two-dimensional Ising model has a *resonance* in the RG flow equations – a nonlinear term at^2 in $\frac{df}{dt}$ that cannot be removed through a coordinate transformation. This leads to a scaling form for the free energy $F(t, h) \sim t^2 \mathcal{F}(h/t^{15/8}) - at^2 \log t$. Here $\nu = 1$ and $\beta = 1/8$ and $\delta = 15$.

Is this compatible with the usual scaling form $F \sim t^{\beta+\beta\delta} \mathcal{F}(h/t^{\beta\delta})$ found at hyperbolic fixed points?

Submit electronically by 8:30 Thursday morning.

Tuesday

Read: *Reexamining the renormalization group: Period doubling onset of chaos*, Archishman Raju and James P Sethna, <https://arxiv.org/abs/1807.09517>.

Exercises

Cardy, exercise 3.5 (Analytic corrections and linearization).

Cardy, exercise 3.6 (Logs from resonances).

Note that 3.6 seems to contradict 3.5! It appears Cardy means ‘generically’ when he says ‘in general’. How do these exercises relate to exercises 12.30 (Nonlinear flows, analytic corrections, and hyperscaling) and 12.31 (Beyond power laws: Nonlinear flows and logarithms in the 2D Ising model) you did in class?