PROBLEM SET 5

Physics 219A, Spring 2014

Due Wednesday, May 28

[1.] Show that the projection operator $T_b(S'|S_1, S_2, S_3)$ for the majority rule for the three site cell discussed in class can be written explicitly in the form

$$T_b = \frac{1}{2}\Big(1 + S'\,\big(\lambda(S_1 + S_2 + S_3) + \mu S_1 S_2 S_3\,\big)\Big)$$

for some values of λ, μ. Use this expression to calculate the same RG equations as we derived in class, for the two cell approximation with $B = 0$. It helps if you write

$$e^{\tilde{J} S_1 S_2} = \cosh\tilde{J}\,\big(1 + S_1 S_2 \tanh\tilde{J}\,\big)$$

and use the same ideas as in the high T expansion.

[2.] <u>Any</u> T_b of the form above should give a RG transformation, since $\sum_{S'} T_b = 1$. In any approximation scheme, the results will depend on μ and λ. Take the case $\mu = 0$ and calculate how the fixed point $\tilde{J}_*$ depends on λ. If you adjust λ so that $\tilde{J}_*$ is at its exact value $0.275\cdots$, how well do you do on the critical exponent ν?