Assignment Three

Due Wednesday, October 27.

[1.] Write a monte carlo program for a chain of L coupled masses and springs with

$$E(x_1, x_2, ...x_L) = \tfrac{1}{2}k_1 \sum_{l=1}^{L} x_l^2 + \tfrac{1}{2}k_2 \sum_{l=1}^{L}(x_l - x_{l+1})^2.$$

Assume periodic boundary conditions, so that the masses at the two opposite ends of the chain connect to each other. (That is, $x_{L+1} = x_1$.) Run your code for $L = 16, k_1 = 1, k_2 = 3$, and three temperatures $T = .5, 1., 2..$ Calculate $c(0) = \langle x_l^2 \rangle$ and check to see that the answer is (within error bars) independent of l. Check against the analytic solution given in class.

[2.] Measure the other "correlation functions" $c(n) = \langle x_l x_{l+n} \rangle$. Check against the analytic solution provided in class.