Question 7

Ising Model for 1D spin system

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Ising model is a model in statistical mechanics which consists of discrete variables that represent magnetic dipole moments of atomic "spins" that can be in one of two states.

Thus, we have 2^N states possible for N particles. We use this as our basis when applying Monte Carlo method to simulate an N particle Ising Model at a given temperature. The Hamiltonian is given by:

$$H(\sigma) = -J \sum_{\langle i\ j \rangle} \sigma_i \sigma_j.$$

Where sigma represents the individual spin of ith particle and i,j are near neighbours.

Using the Hamiltonian, we calculate the energy and magnetization. Using lattice size=50:

Plotting Energy vs Temperature
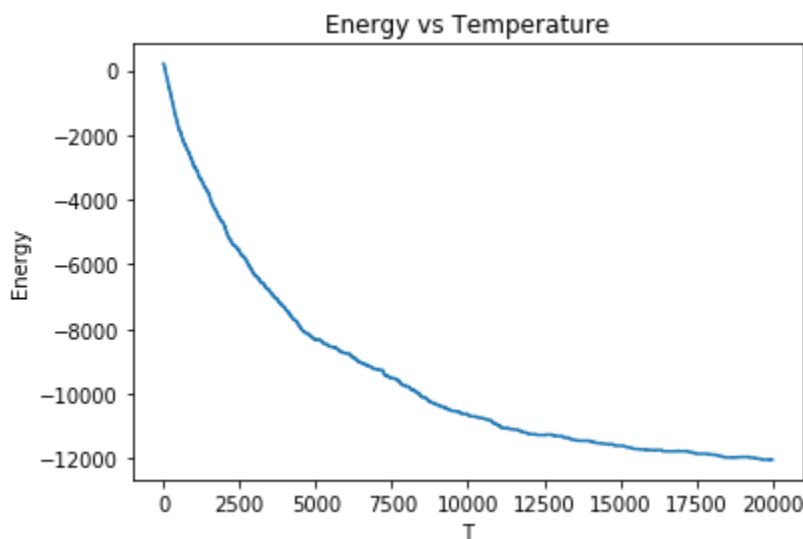
Energy decreases exponentially

Plotting Magnetization vs Temperature

Magnetization vs Temperature