Assignment 3

Vignesh M Pai (20211132)

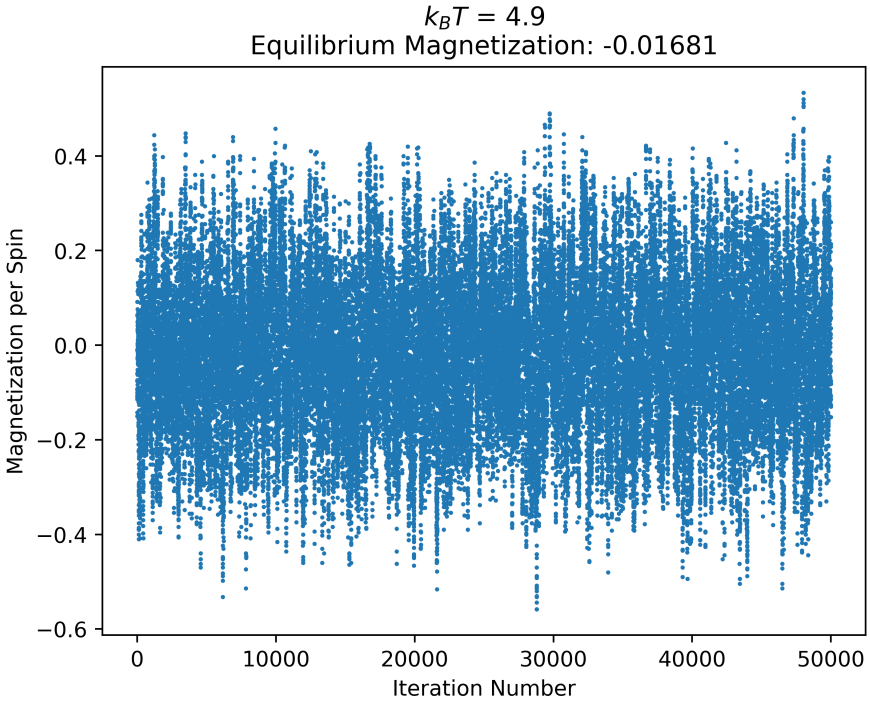
1

The total magnetic moment will be $-L^3$ or -8000.

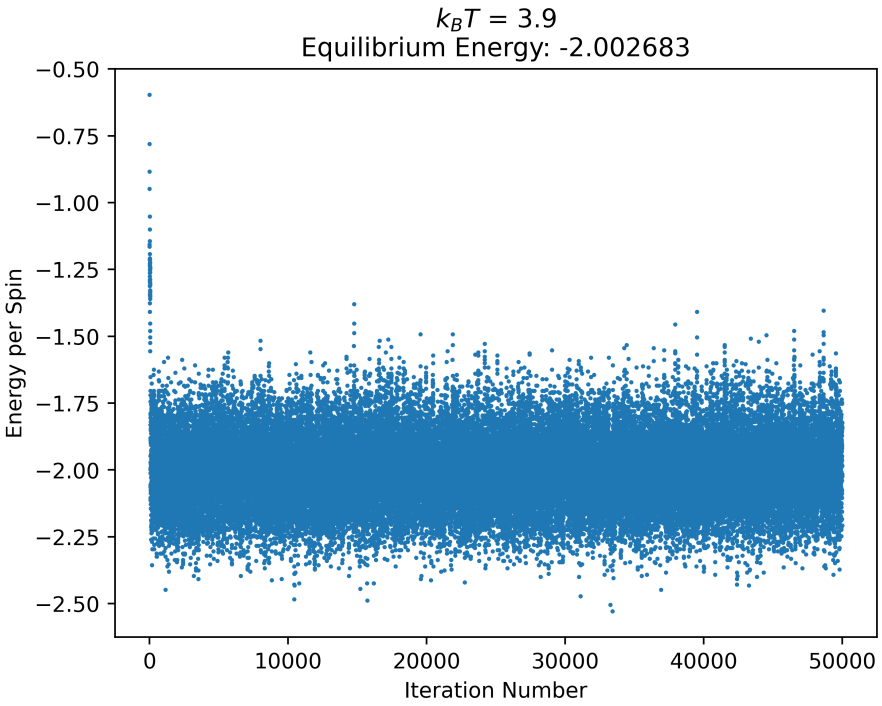
2

The number of interactions is 4 per spin and thus $4L^3/2 = 2L^3$. Since all interactions will contribute to $-J$ interaction energy, the total energy will be $-2JL^3 = -2000$.

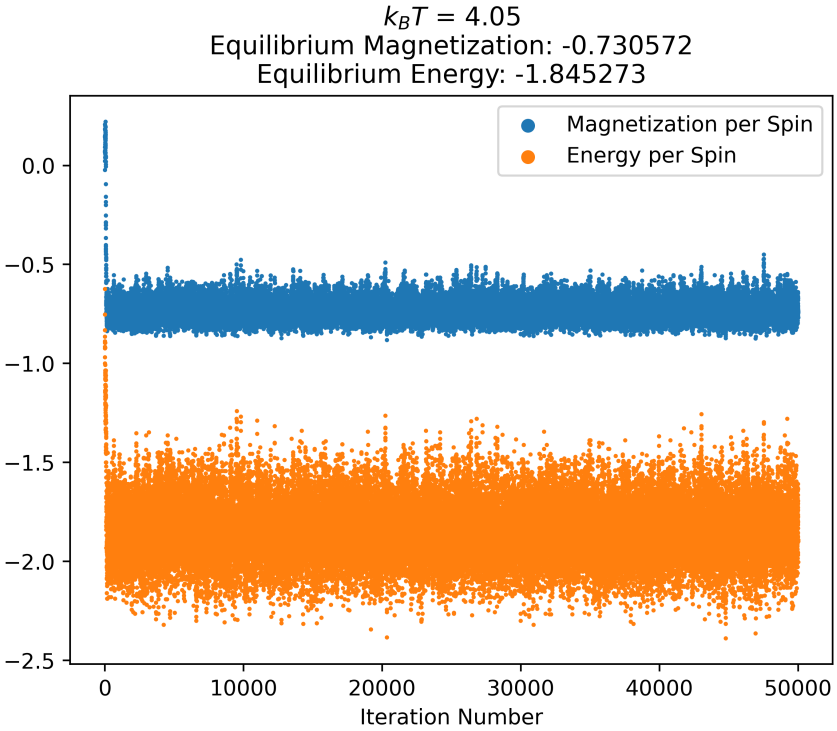
3



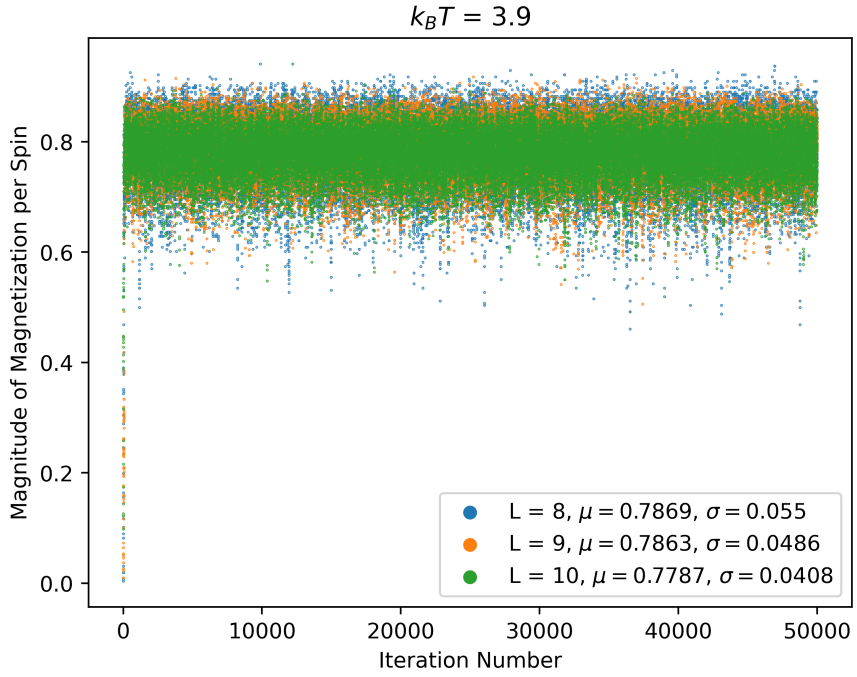
4

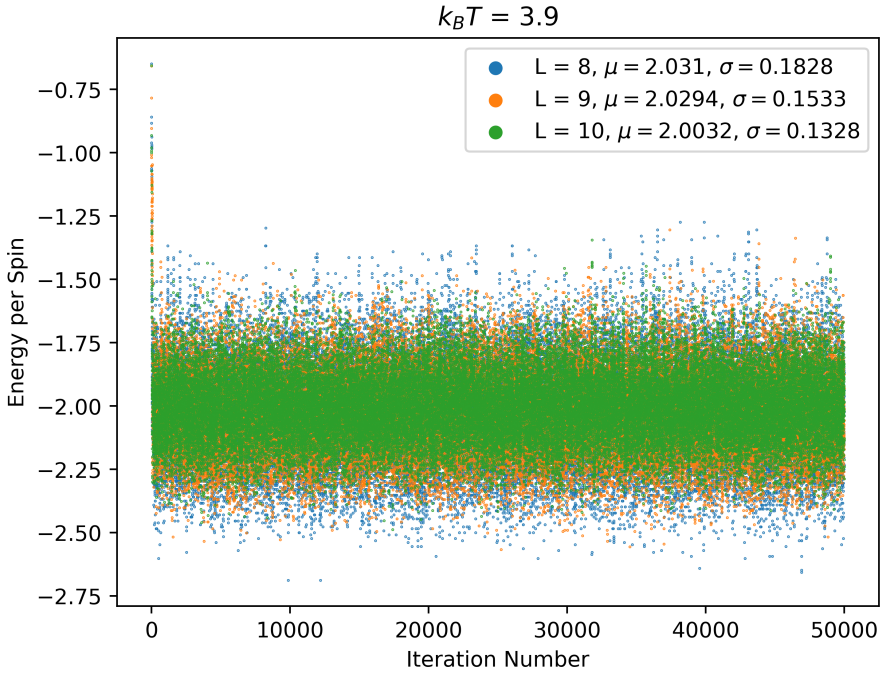

k_BT = 3.9
Equilibrium Energy: -2.002683
Energy per Spin
−0.50
−0.75
−1.00
−1.25
−1.50
−1.75
−2.00
−2.25
−2.50
0
10000
20000
30000
40000
50000
Iteration Number

5

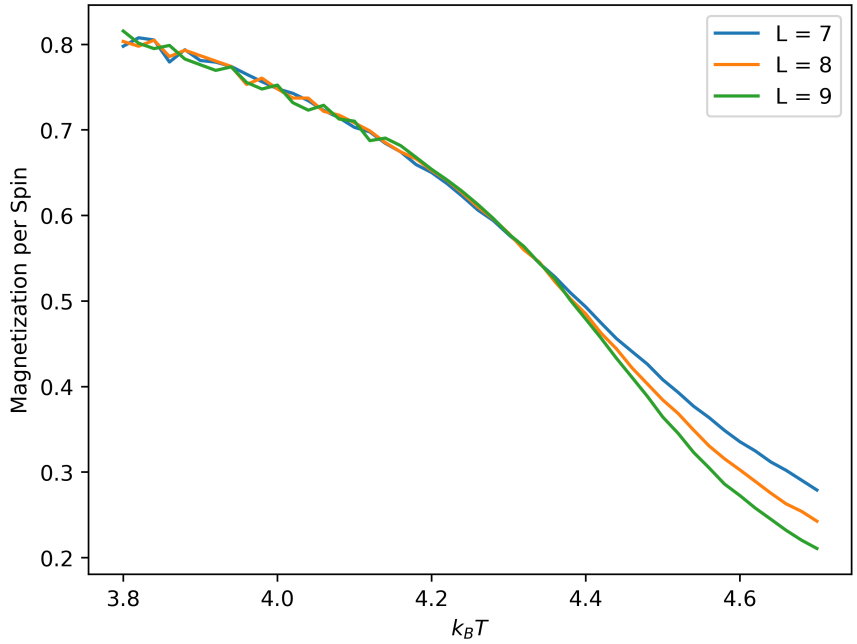

k_BT = 4.05
Equilibrium Magnetization: -0.730572
Equilibrium Energy: -1.845273
Magnetization per Spin
Energy per Spin
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
0
10000
20000
30000
40000
50000
Iteration Number

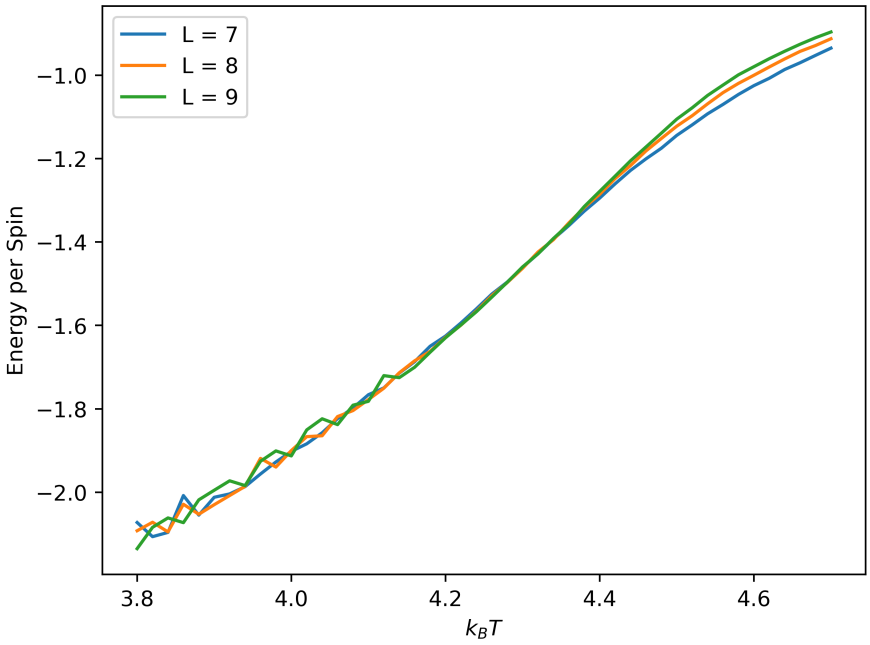
6

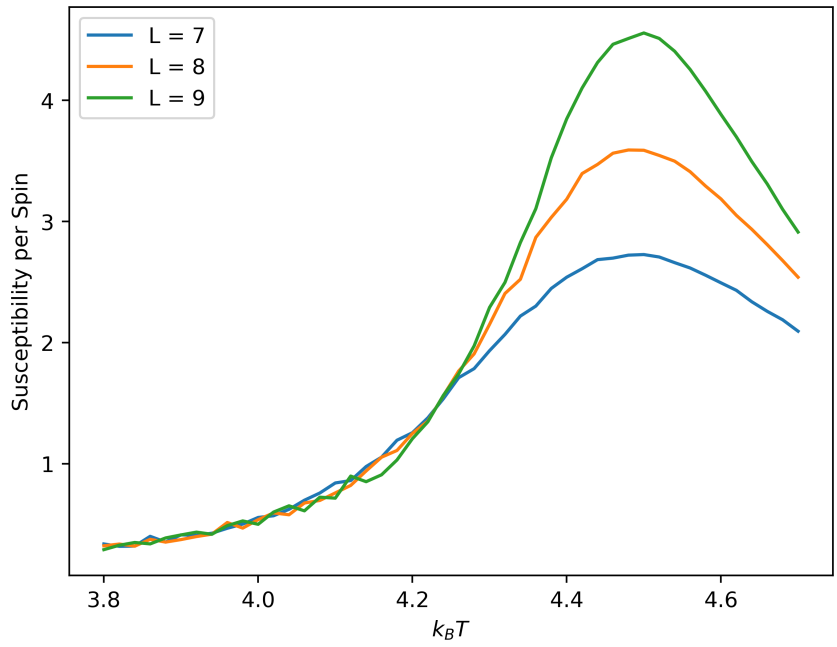

k_BT = 3.9
Magnitude of Magnetization per Spin
0.0
0.2
0.4
0.6
0.8
0
10000
20000
30000
40000
50000
Iteration Number
L = 8, μ = 0.7869, σ = 0.055
L = 9, μ = 0.7863, σ = 0.0486
L = 10, μ = 0.7787, σ = 0.0408

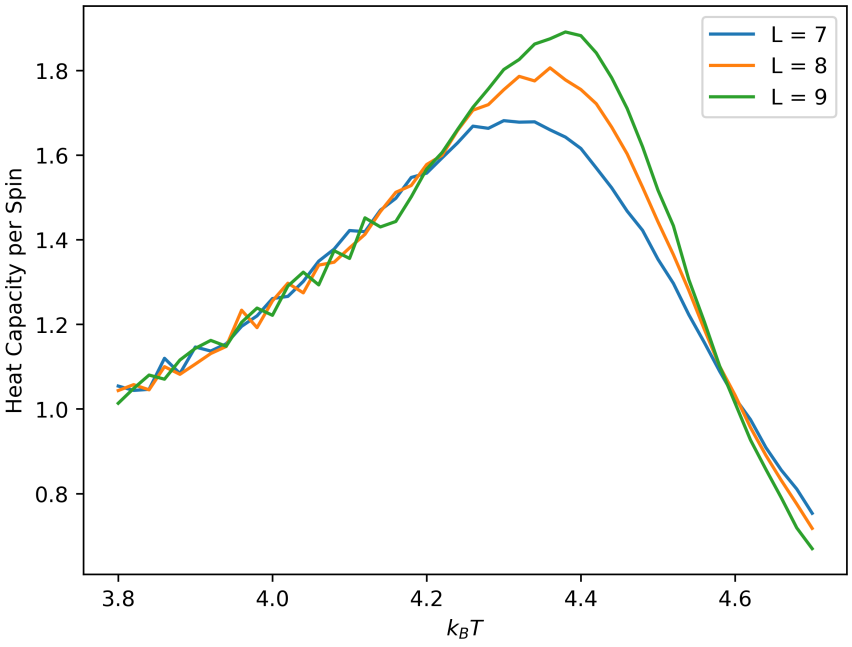

k_BT = 3.9
Energy per Spin
−0.75
−1.00
−1.25
−1.50
−1.75
−2.00
−2.25
−2.50
−2.75
0
10000
20000
30000
40000
50000
Iteration Number
L = 8, μ = 2.031, σ = 0.1828
L = 9, μ = 2.0294, σ = 0.1533
L = 10, μ = 2.0032, σ = 0.1328

Figures


L = 7
L = 8
L = 9
Magnetization per Spin
0.8
0.7
0.6
0.5
0.4
0.3
0.2
3.8
4.0
4.2
4.4
4.6
k_BT


L = 7
L = 8
L = 9
Energy per Spin
−1.0
−1.2
−1.4
−1.6
−1.8
−2.0
3.8
4.0
4.2
4.4
4.6
k_BT


L = 7
L = 8
L = 9
Susceptibility per Spin
1
2
3
4
3.8
4.0
4.2
4.4
4.6
k_BT


L = 7
L = 8
L = 9
Heat Capacity per Spin
0.8
1.0
1.2
1.4
1.6
1.8
3.8
4.0
4.2
4.4
4.6
k_BT