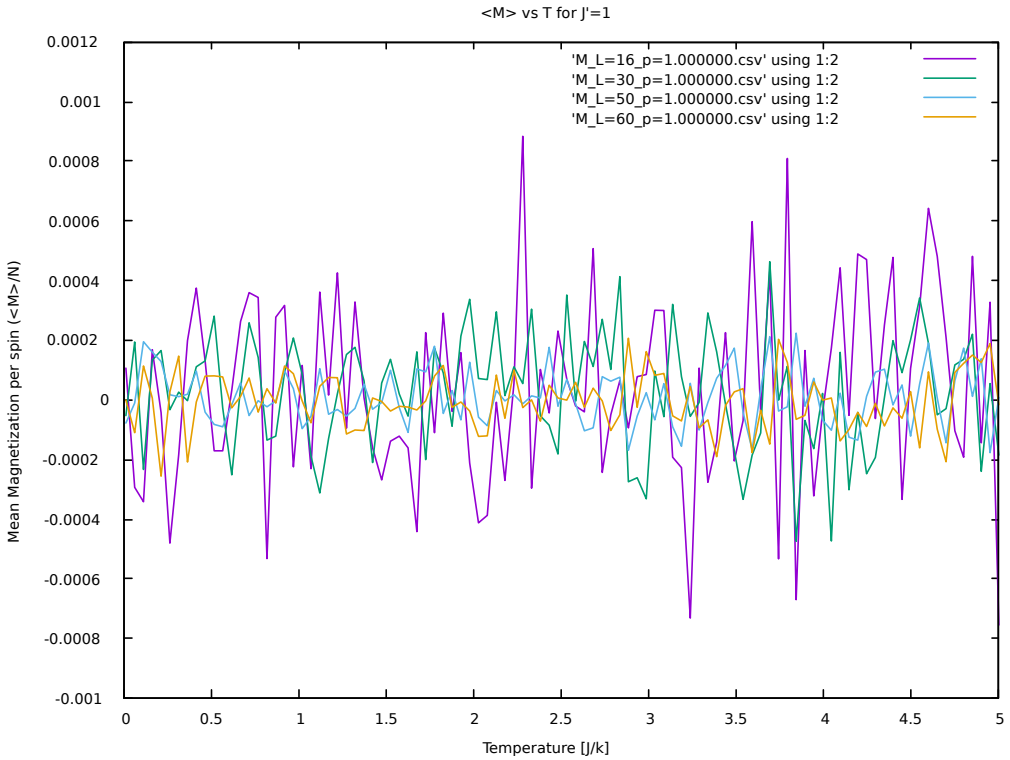
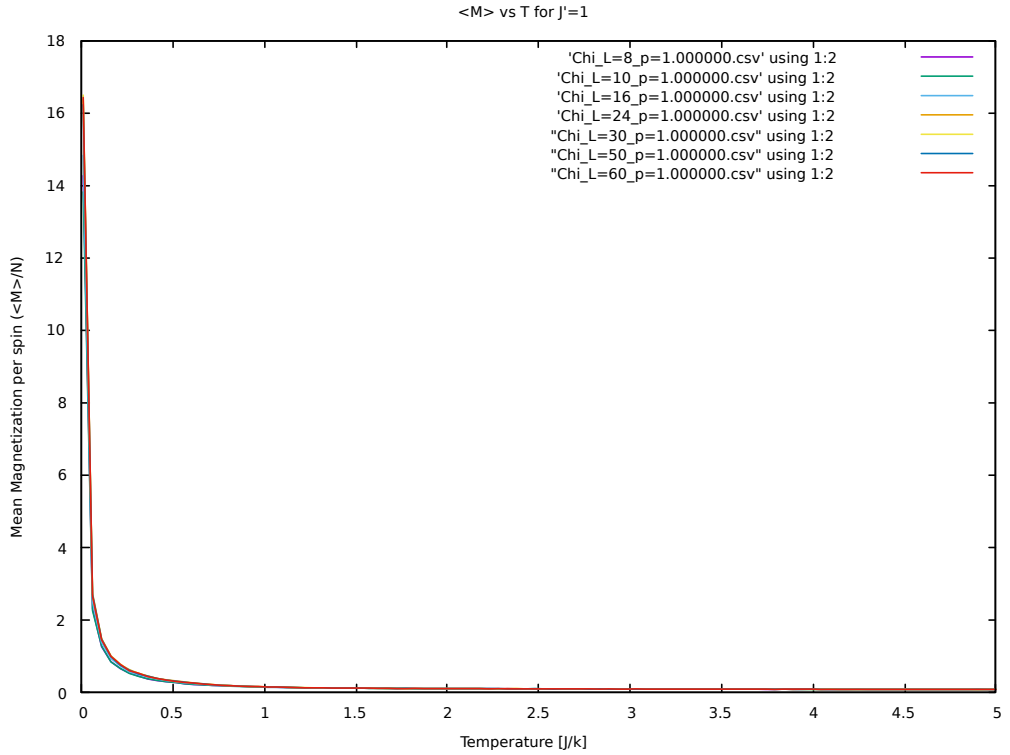
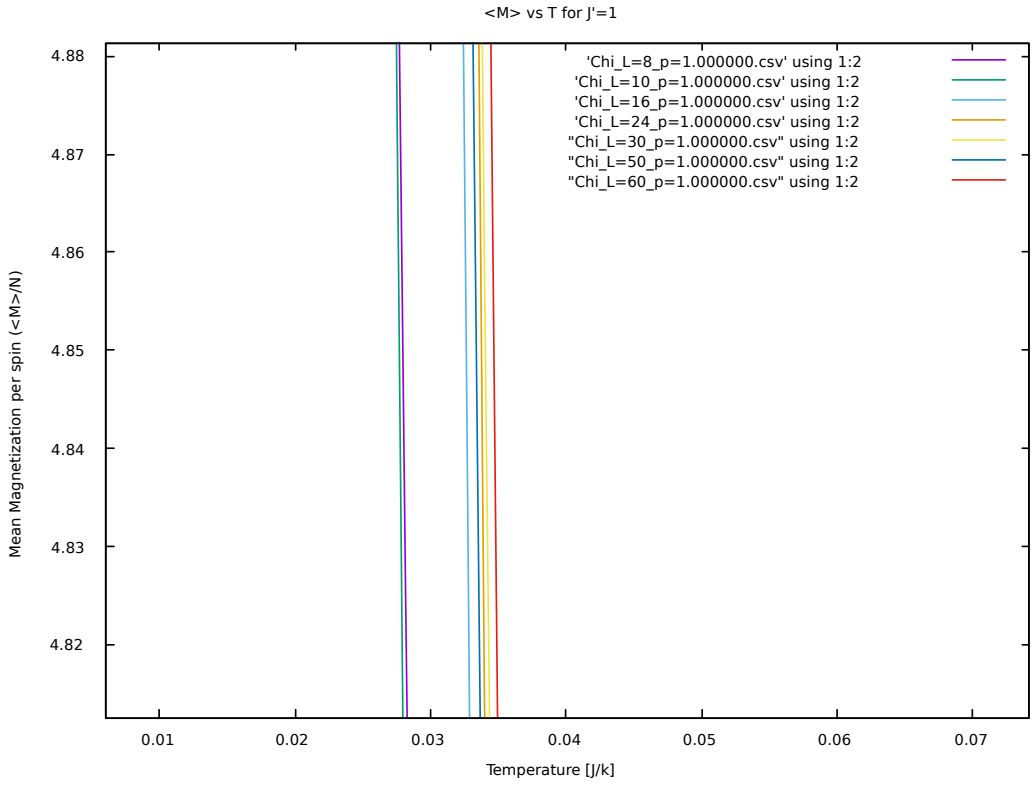
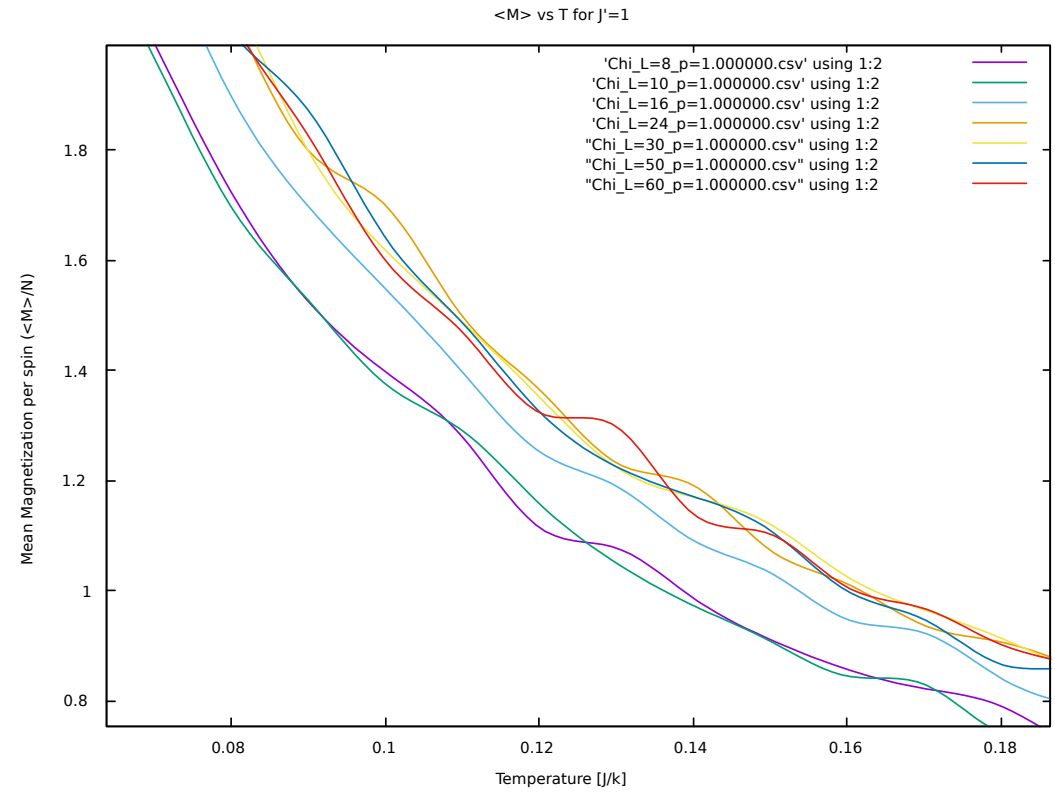
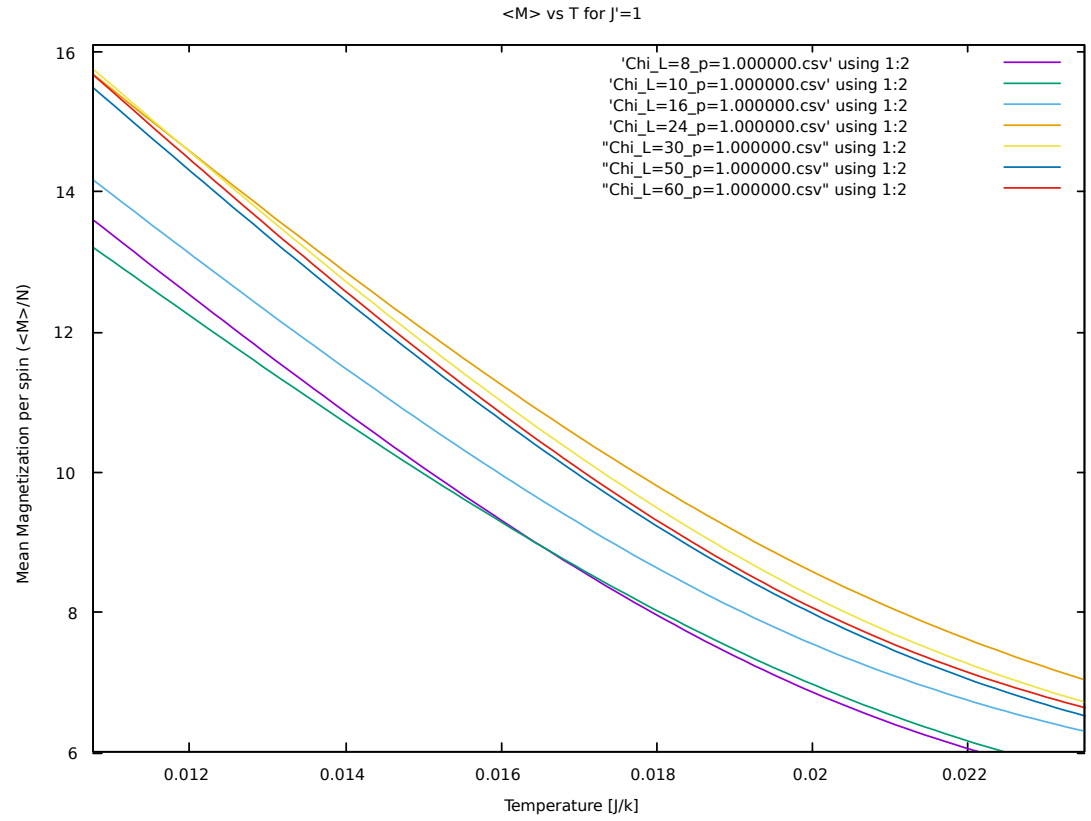
Task 1: Ferromagnetic Susceptibility for the Triangular Limit ($J' = 1$)

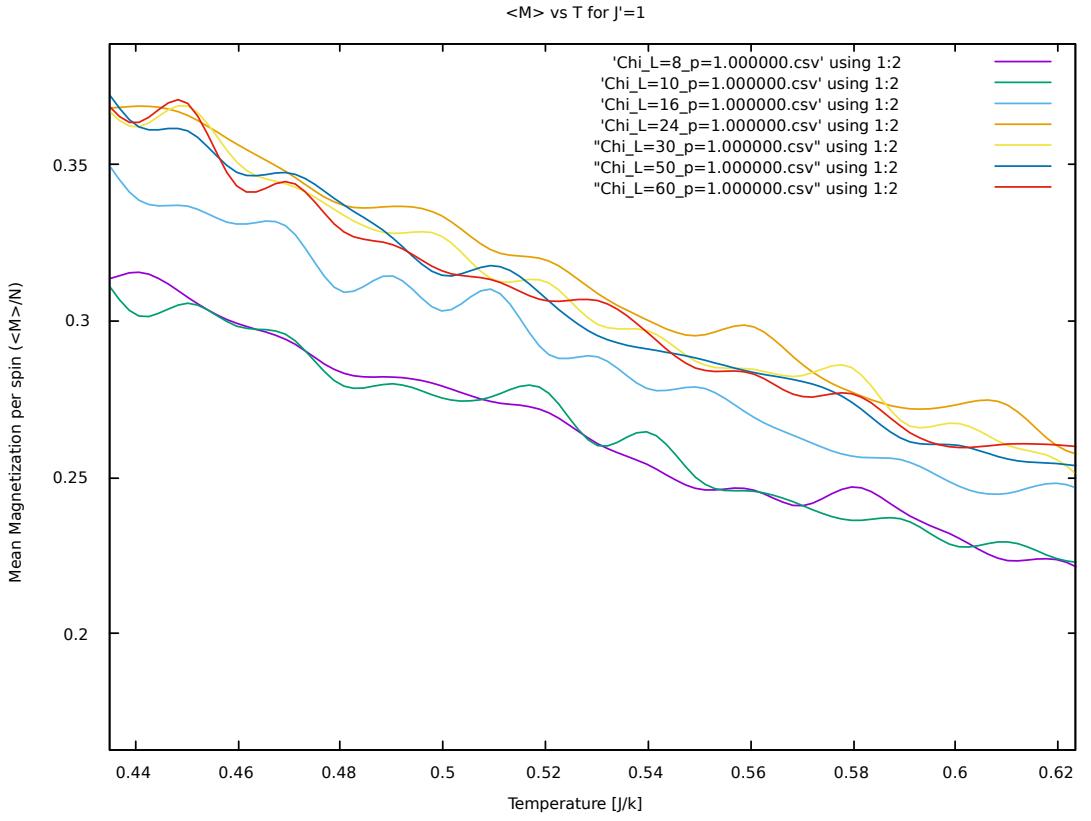





<M> vs T for J'=1
'Chi_L=8_p=1.000000.csv' using 1:2
'Chi_L=10_p=1.000000.csv' using 1:2
'Chi_L=16_p=1.000000.csv' using 1:2
'Chi_L=24_p=1.000000.csv' using 1:2
"Chi_L=30_p=1.000000.csv" using 1:2
"Chi_L=50_p=1.000000.csv" using 1:2
"Chi_L=60_p=1.000000.csv" using 1:2
Mean Magnetization per spin (<M>/N)
4.88
4.87
4.86
4.85
4.84
4.83
4.82
0.01
0.02
0.03
0.04
0.05
0.06
0.07
Temperature [J/k]


<M> vs T for J'=1
'Chi_L=8_p=1.000000.csv' using 1:2
'Chi_L=10_p=1.000000.csv' using 1:2
'Chi_L=16_p=1.000000.csv' using 1:2
'Chi_L=24_p=1.000000.csv' using 1:2
"Chi_L=30_p=1.000000.csv" using 1:2
"Chi_L=50_p=1.000000.csv" using 1:2
"Chi_L=60_p=1.000000.csv" using 1:2
Mean Magnetization per spin (<M>/N)
1.8
1.6
1.4
1.2
1
0.8
0.08
0.1
0.12
0.14
0.16
0.18
Temperature [J/k]

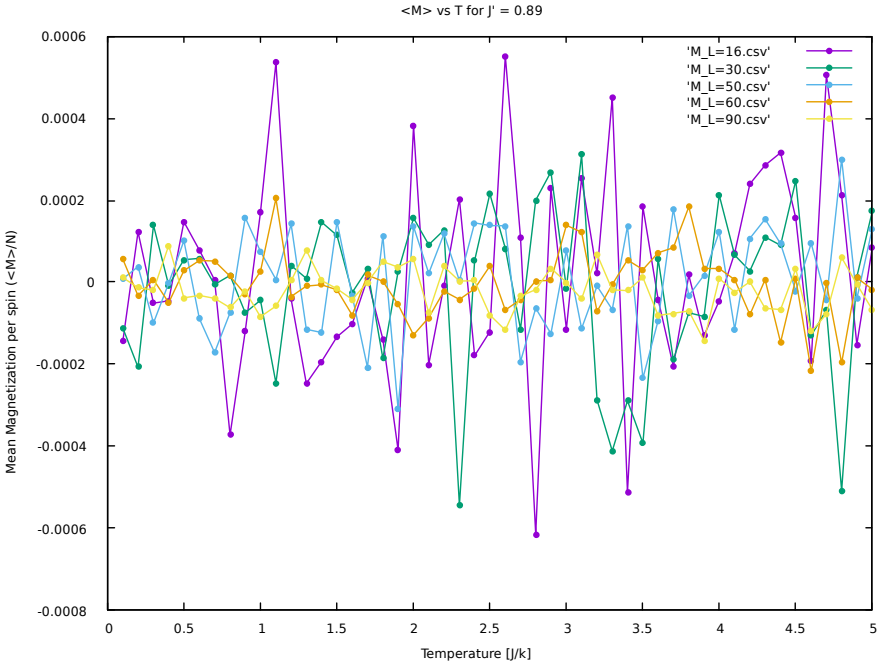

<M> vs T for J'=1
'Chi_L=8_p=1.000000.csv' using 1:2
'Chi_L=10_p=1.000000.csv' using 1:2
'Chi_L=16_p=1.000000.csv' using 1:2
'Chi_L=24_p=1.000000.csv' using 1:2
"Chi_L=30_p=1.000000.csv" using 1:2
"Chi_L=50_p=1.000000.csv" using 1:2
"Chi_L=60_p=1.000000.csv" using 1:2
Mean Magnetization per spin (<M>/N)
Temperature [J/k]
16
14
12
10
8
6
0.012
0.014
0.016
0.018
0.02
0.022

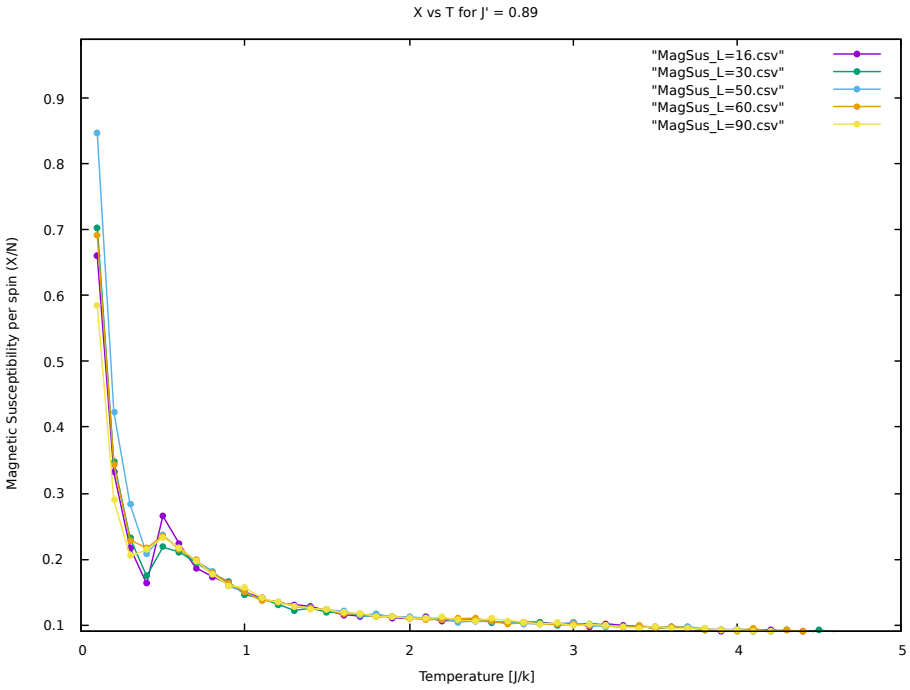

<M> vs T for J'=1
'Chi_L=8_p=1.000000.csv' using 1:2
'Chi_L=10_p=1.000000.csv' using 1:2
'Chi_L=16_p=1.000000.csv' using 1:2
'Chi_L=24_p=1.000000.csv' using 1:2
"Chi_L=30_p=1.000000.csv" using 1:2
"Chi_L=50_p=1.000000.csv" using 1:2
"Chi_L=60_p=1.000000.csv" using 1:2
Mean Magnetization per spin (<M>/N)
Temperature [J/k]
0.35
0.3
0.25
0.2
0.44
0.46
0.48
0.5
0.52
0.54
0.56
0.58
0.6
0.62

- *No. of Monte Carlo steps = 10000;*
- *No. of transient/equilibration steps = 50000.*
- *The temperature has been varied from 5.0 to 0.01 at steps of 0.01;*

Remarks: As expected, the curves approach infinity close to zero temperature. The ferromagnetic susceptibility should have increased with the system size, but these curves seem to be doing all sorts of thing, crossing each other at various temperatures. Several zoomed version of the susceptibility curve has been shown above for different temperature windows.

Task 2: Ferromagnetic Susceptibility for $J' = 0.89$





- *No. of Monte Carlo steps = 10000;*
- *No. of transient/equilibration steps = 50000;*
- *The temperature has been varied from 5.0 to 0.1 at steps of 0.1;*

- *Remarks:* As per the expectation, the susceptibility should have been very large at some intermediate temperature window. From the graph above, we find that the susceptibility does show a peak for some intermediate temperature, though is doesn't go well with the expectation of being *very large* ! Now, only focussing near very low temperature window, we expected that the susceptibility must scale as the system size, L. The lattices L=16, L=30, L=50, seem to show the trend correctly, which is disturbed by L=60 having lower susceptibility than L=50 for T=0.1 and L=90 even lower (in fact the lowest amongst all for T = 0.1).

Task 3: Histograms for $J = 0.89$

(Please open and scroll through the ods file named "Hist_L=60_p=0.890000.ods" in this folder to view the data and histograms at various temperatures)

- *The Histograms have been plotted for L = 60 and J' = 0.89;*
- *The temperature has been varied from 5.0 to 0.1 at steps of 0.1;*
- *No. of Monte Carlo steps = 10000;*
- *No. of transient/equilibration steps = 50000;*
- *For each temperature, the histograms have been taken at steps of every 100th Monte Carlo iteration.*

- *Remarks:* The histograms plotted in this case seems to agree well with the previous case, where I took the histograms pertaining to the system that I obtained at the end of all the Monte Carlo steps for a particular temperature. In the current case too, no Neel Temperature was attained, as is evident since the system didn't choose any particular configuration, though the configurations 9 and 10 (10 and 11 in the histogram charts) dominated at all temperatures.