

1 Results

1.1 2×2 lattice, analytical expressoins

If we scale the value of β from $1/k_B T$ to $1/J$ (Scaling factor $k_B T/J$) in the analytical expression from section ??, we will get a good benchmark for computer computations to come. These values are listed in table 1 below. Note that all values are divided by four, since we want the values per bond, and not for the entire lattice.

Mean energy, $\langle E \rangle$:	-1.9960
Mean absolute magnetization, $\langle \mathcal{M} \rangle$:	0.9987
Specific heat capacity, C_V :	0.0321
Susceptibility, χ :	3.9933

Table 1: Benchmark for material characteristics per bond for a 2×2 lattice

1.2 Ising model: simulation over temperature

We ran the program for different amounts of Monte Carlo cycles and plottet the error (analytical - simulated) in figure 1 below. It seems we want to use around 10^7 MC cycles or more to get a good simulation.

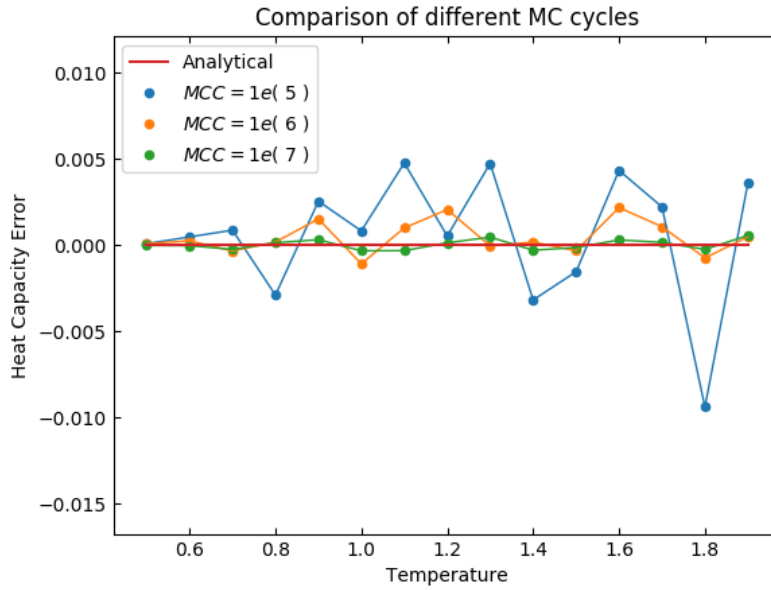


Figure 1: Shows the accuracy of different amount of MC cycles over temperature.

1.3 20×20 lattice, analytical expressions

$T = 1.0(kT/J)$: Mean energy and magnetization func of MC cycles: Ordnet orientering: Program initialize.cpp (For $T \leq 1.5$ så er alle spinn opp, ellers spinn ned)

sett inn følgende bilder fra mappe M+E under img: $T1_1.png T1_2.png$ Tekst :
ordnetspinnorientering for $T = 1.0$

Random spinn orientering: Program initialize, *andom(Setter spinn ned (-1) hvis verdi er negativ)*

sett inn følgende bilder fra mappe M+E under img: $L20T1random_1.png L20T1random_2.png$ Tekst :
Randomspinnorientering for $T = 1.0$

Likevekt:

$T = 2.4(kT/J)$: Mean energy and magnetization func of MC cycles: Ordnet orientering: Program initialize.cpp (For $T \leq 1.5$ så er alle spinn opp, ellers spinn ned)

sett inn følgende bilder fra mappe M+E (ligger inni img): $T2_1.png T2_2.png$ Tekst :
ordnetspinnorientering for $T = 2.4$

Random spinn orientering: Program initialize, *andom(Setter spinn ned (-1) hvis verdi er negativ)*

$L20T1random_1.png L20T1random_2.png$ Tekst : *Randomspinnorientering for $T = 2.4$*

Likevekt:

Oversiktlig tabell med når likevekt nås ca. (antall mcs)

Ordnet magnetisering Random magnetisering Ordnet energi Random energi

T1: T2:

Estimat av equilibration time:

Antall aksepterte spinn per montecarlo cycle

Diskusjon/resultater Aksepterte spinn som funksjon av T : Økt temperatur gir flere aksepterte flips. Setter man startpoint til random går den forttere mot likevekt ?