Brendan Philbin
Ising Model Minimum Energy

Import relevant files and define plots

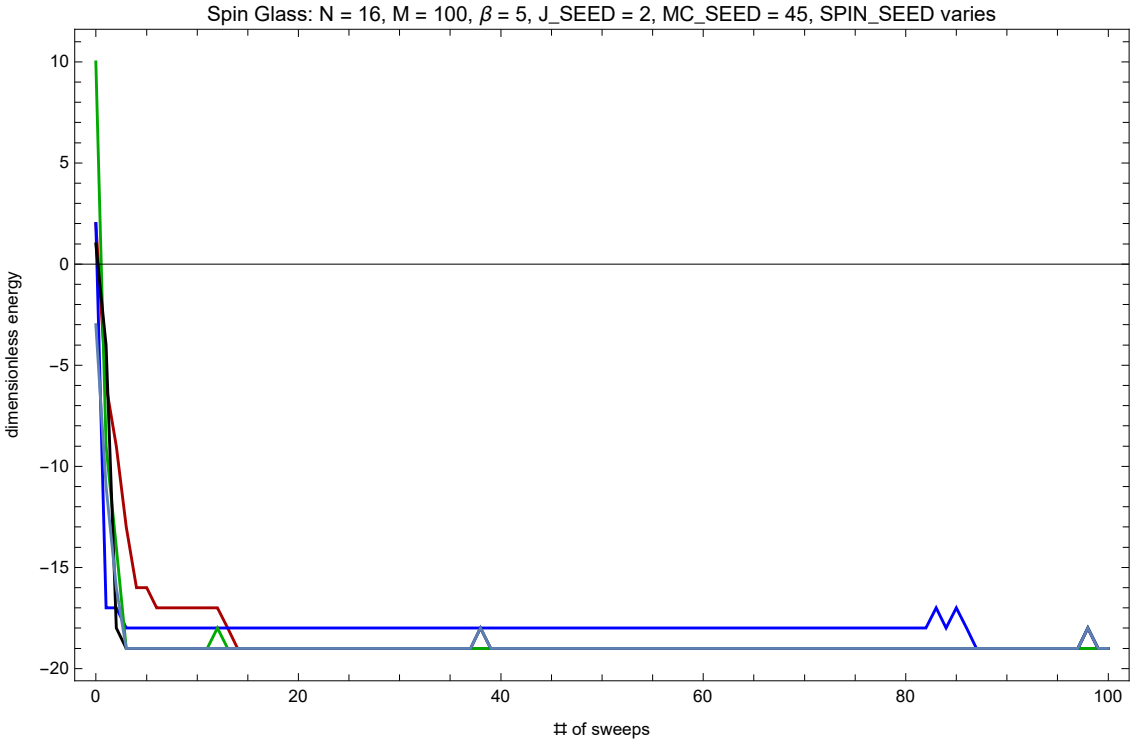
In[1]:=
```
Clear["Global`*"];
SetDirectory[NotebookDirectory[]];
numSweeps = Range[0, 100];
colors = {Darker[Red], Blue, Darker[Green], Black, Orange};
trials = Range[1, 50];
plots = Range[1, 50];
For[i = 1, i ≤ 50, i++,
  Evaluate[Symbol["rawTrial" <> ToString[i]]] =
   Flatten[Import["min_energy_output" <> ToString[i] <> ".csv", "CSV"]];
  Evaluate[Symbol["trial" <> ToString[i]]] =
   Transpose[{numSweeps, Evaluate[Symbol["rawTrial" <> ToString[i]]]}];
  trials[[i]] = Evaluate[Symbol["trial" <> ToString[i]]];
  Evaluate[Symbol["plot" <> ToString[i]]] =
   ListLinePlot[trials[[i]], PlotStyle → colors[[Mod[i, 5]]]];
  plots[[i]] = Evaluate[Symbol["plot" <> ToString[i]]];
 ];
```

Create 10 plots grouping 5 trials with same J_SEED

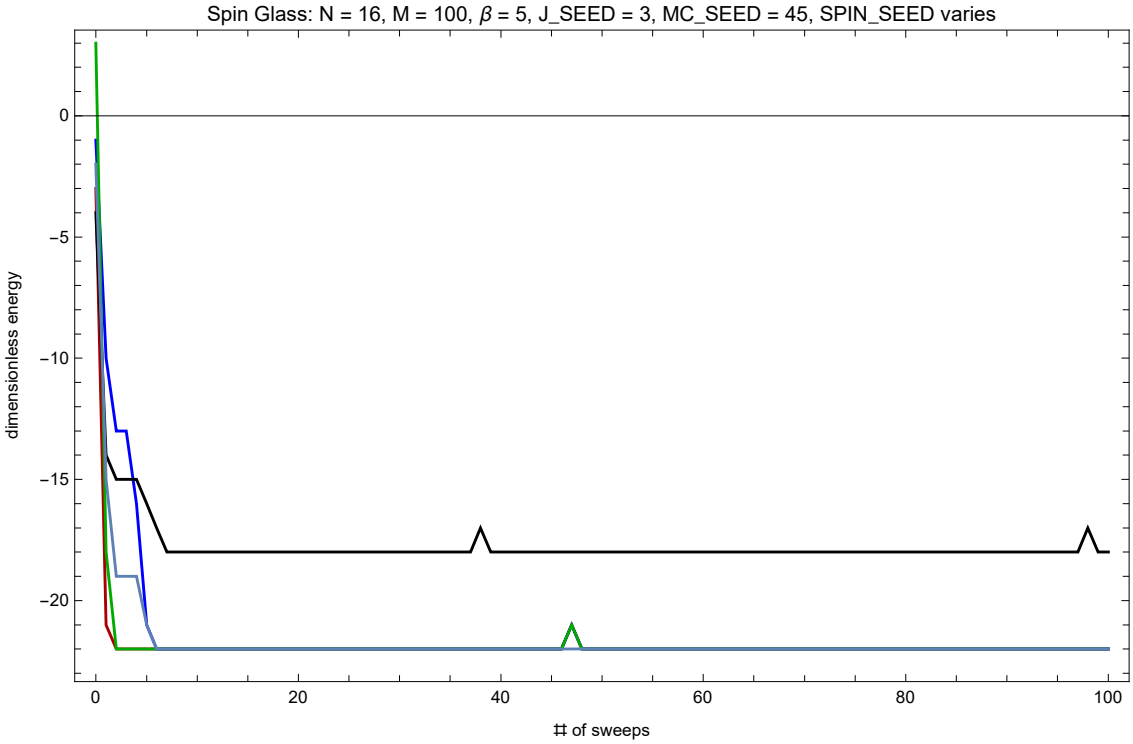
In[8]:=
```
Show[plots[[1]], plots[[2]], plots[[3]], plots[[4]],
 plots[[5]], Frame → True, FrameStyle → Black, LabelStyle → Black,
 FrameLabel → {"# of sweeps", "dimensionless energy"}, PlotRange → All, PlotLabel →
  "Spin Glass: N = 16, M = 100, β = 5, J_SEED = 2, MC_SEED = 45, SPIN_SEED varies"]

Show[plots[[6]], plots[[7]], plots[[8]], plots[[9]],
 plots[[10]], Frame → True, FrameStyle → Black, LabelStyle → Black,
 FrameLabel → {"# of sweeps", "dimensionless energy"}, PlotRange → All, PlotLabel →
  "Spin Glass: N = 16, M = 100, β = 5, J_SEED = 3, MC_SEED = 45, SPIN_SEED varies"]

Show[plots[[11]], plots[[12]], plots[[13]], plots[[14]],
 plots[[15]], Frame → True, FrameStyle → Black, LabelStyle → Black,
 FrameLabel → {"# of sweeps", "dimensionless energy"}, PlotRange → All, PlotLabel →
  "Spin Glass: N = 16, M = 100, β = 5, J_SEED = 4, MC_SEED = 45, SPIN_SEED varies"]
```

```
Show[plots[[16]], plots[[17]], plots[[18]], plots[[19]],
 plots[[10]], Frame → True, FrameStyle → Black, LabelStyle → Black,
 FrameLabel → {"# of sweeps", "dimensionless energy"}, PlotRange → All, PlotLabel →
  "Spin Glass: N = 16, M = 100, β = 5, J_SEED = 5, MC_SEED = 45, SPIN_SEED varies"]

Show[plots[[21]], plots[[22]], plots[[23]], plots[[24]],
 plots[[25]], Frame → True, FrameStyle → Black, LabelStyle → Black,
 FrameLabel → {"# of sweeps", "dimensionless energy"}, PlotRange → All, PlotLabel →
  "Spin Glass: N = 16, M = 100, β = 5, J_SEED = 6, MC_SEED = 45, SPIN_SEED varies"]

Show[plots[[26]], plots[[27]], plots[[28]], plots[[29]],
 plots[[30]], Frame → True, FrameStyle → Black, LabelStyle → Black,
 FrameLabel → {"# of sweeps", "dimensionless energy"}, PlotRange → All, PlotLabel →
  "Spin Glass: N = 32, M = 100, β = 5, J_SEED = 2, MC_SEED = 45, SPIN_SEED varies"]

Show[plots[[31]], plots[[32]], plots[[33]], plots[[34]],
 plots[[35]], Frame → True, FrameStyle → Black, LabelStyle → Black,
 FrameLabel → {"# of sweeps", "dimensionless energy"}, PlotRange → All, PlotLabel →
  "Spin Glass: N = 32, M = 100, β = 5, J_SEED = 3, MC_SEED = 45, SPIN_SEED varies"]

Show[plots[[36]], plots[[37]], plots[[38]], plots[[39]],
 plots[[40]], Frame → True, FrameStyle → Black, LabelStyle → Black,
 FrameLabel → {"# of sweeps", "dimensionless energy"}, PlotRange → All, PlotLabel →
  "Spin Glass: N = 32, M = 100, β = 5, J_SEED = 4, MC_SEED = 45, SPIN_SEED varies"]

Show[plots[[41]], plots[[42]], plots[[43]], plots[[44]],
 plots[[45]], Frame → True, FrameStyle → Black, LabelStyle → Black,
 FrameLabel → {"# of sweeps", "dimensionless energy"}, PlotRange → All, PlotLabel →
  "Spin Glass: N = 32, M = 100, β = 5, J_SEED = 5, MC_SEED = 45, SPIN_SEED varies"]

Show[plots[[46]], plots[[47]], plots[[48]], plots[[49]],
 plots[[50]], Frame → True, FrameStyle → Black, LabelStyle → Black,
 FrameLabel → {"# of sweeps", "dimensionless energy"}, PlotRange → All, PlotLabel →
  "Spin Glass: N = 32, M = 100, β = 5, J_SEED = 6, MC_SEED = 45, SPIN_SEED varies"]
```

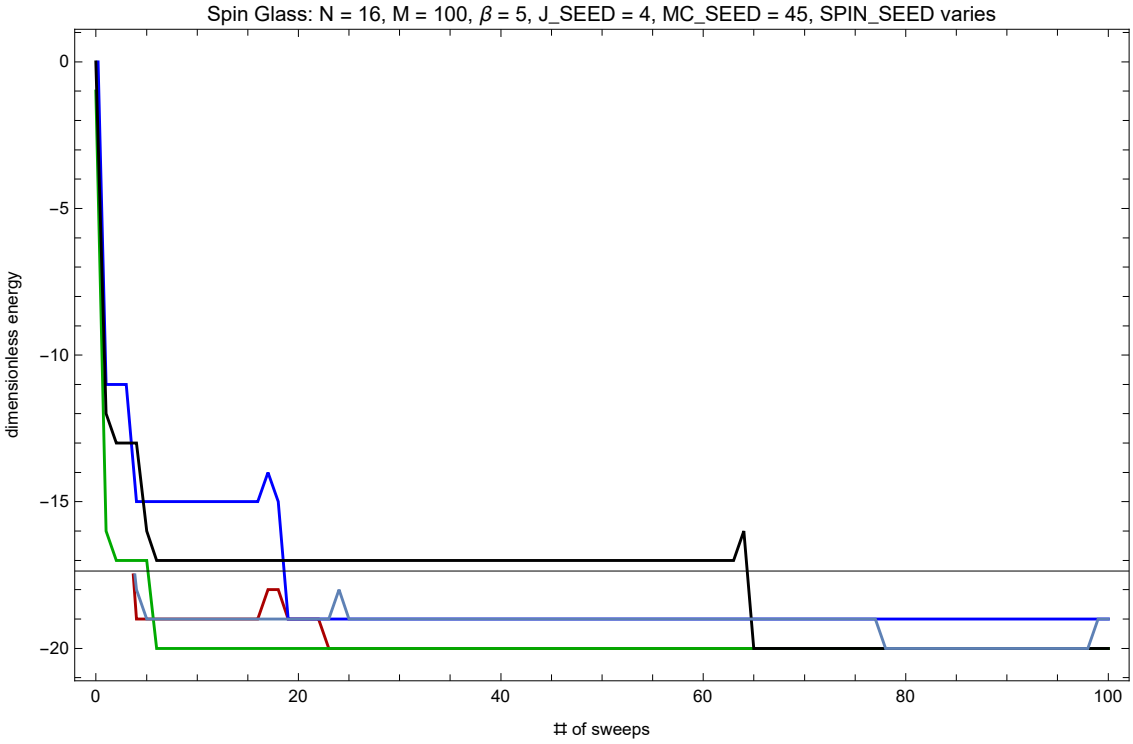
Out[8]=


Spin Glass: N = 16, M = 100, β = 5, J_SEED = 2, MC_SEED = 45, SPIN_SEED varies
dimensionless energy
# of sweeps
10
5
0
−5
−10
−15
−20
0
20
40
60
80
100

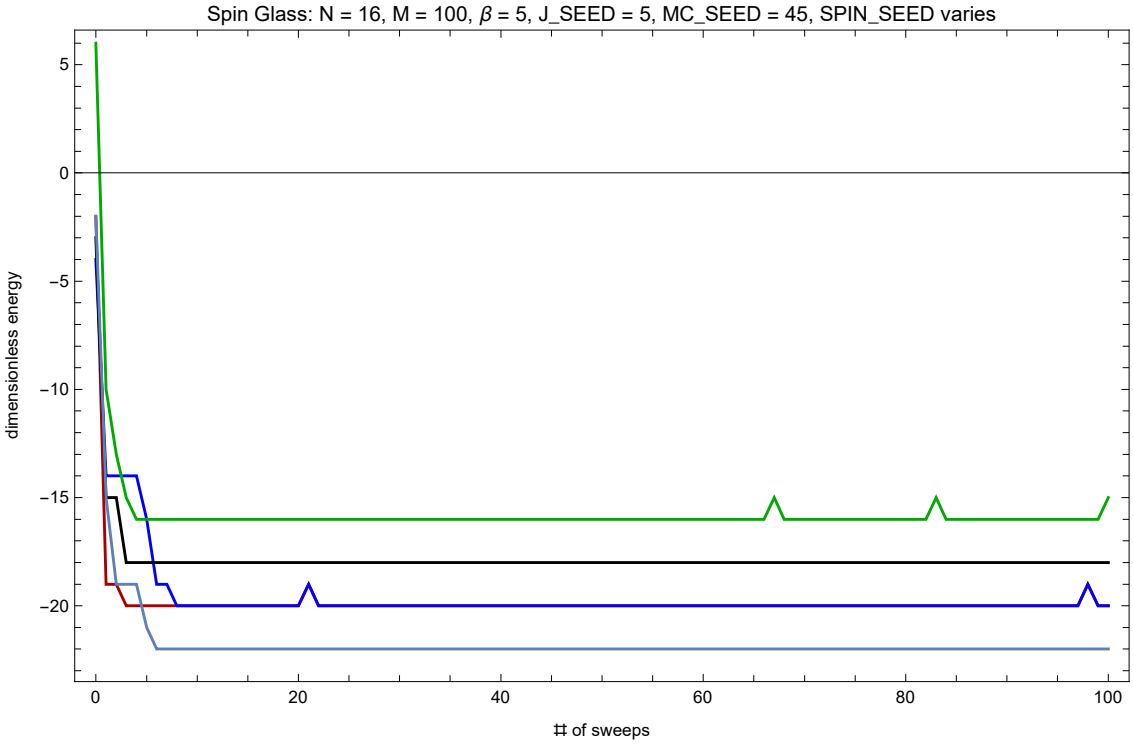
Out[9]=


Spin Glass: N = 16, M = 100, β = 5, J_SEED = 3, MC_SEED = 45, SPIN_SEED varies
dimensionless energy
# of sweeps
0
−5
−10
−15
−20
0
20
40
60
80
100

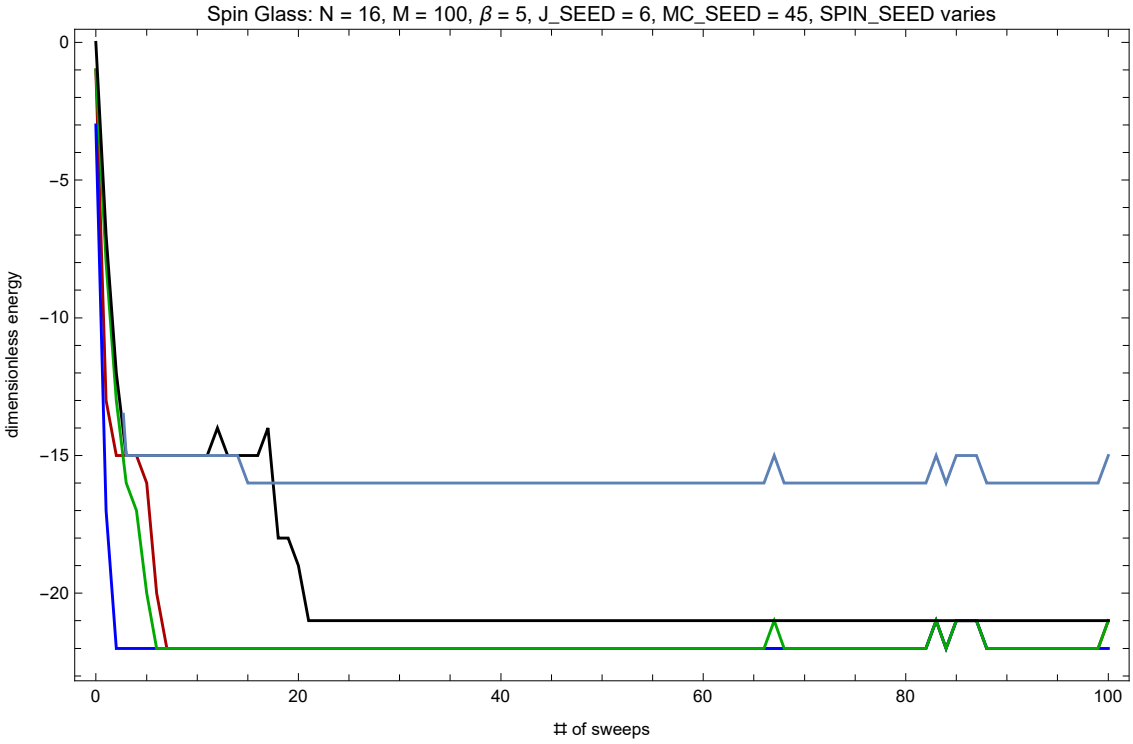
Out[10]=


Spin Glass: N = 16, M = 100, β = 5, J_SEED = 4, MC_SEED = 45, SPIN_SEED varies
dimensionless energy
# of sweeps
0
−5
−10
−15
−20
0
20
40
60
80
100

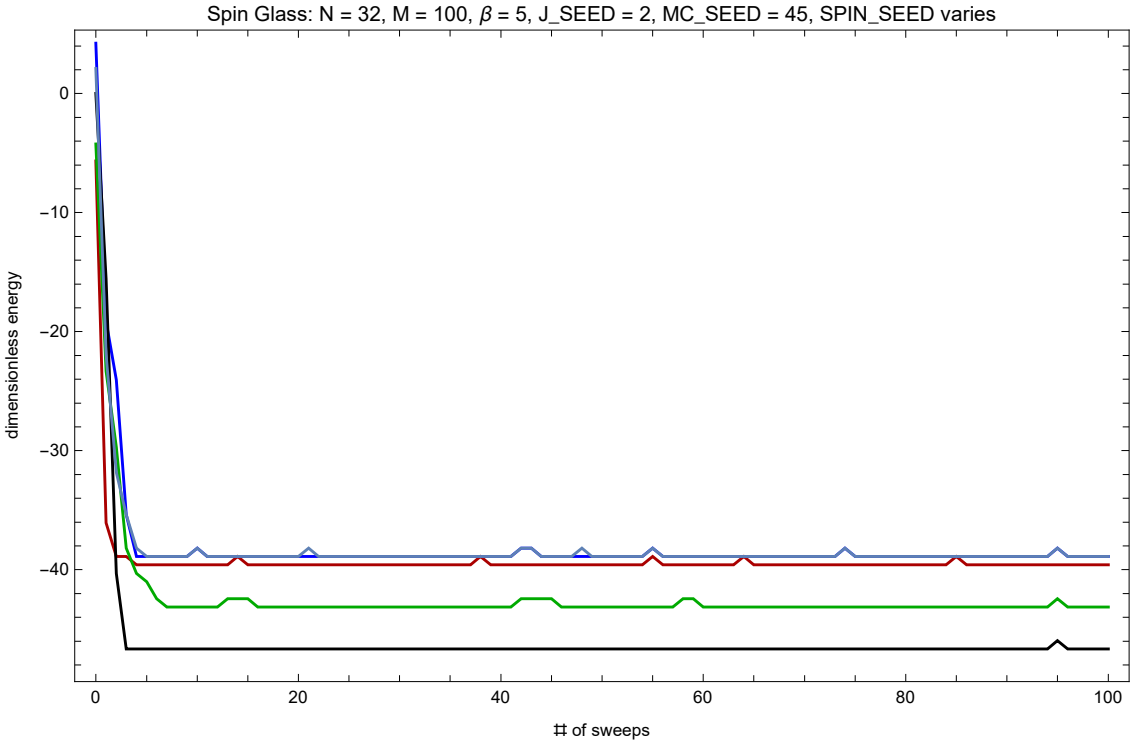
Out[11]=


Spin Glass: N = 16, M = 100, β = 5, J_SEED = 5, MC_SEED = 45, SPIN_SEED varies
dimensionless energy
# of sweeps
5
0
−5
−10
−15
−20
0
20
40
60
80
100

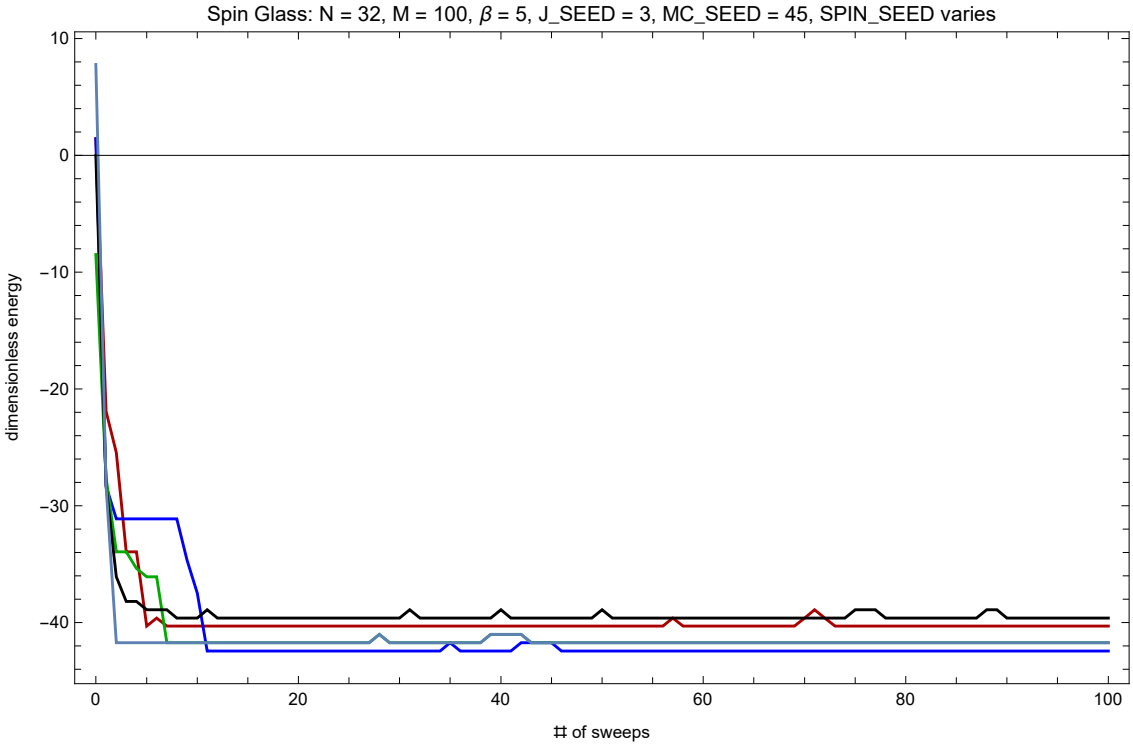
Out[12]=


Spin Glass: N = 16, M = 100, β = 5, J_SEED = 6, MC_SEED = 45, SPIN_SEED varies
dimensionless energy
0
−5
−10
−15
−20
0
20
40
60
80
100
# of sweeps

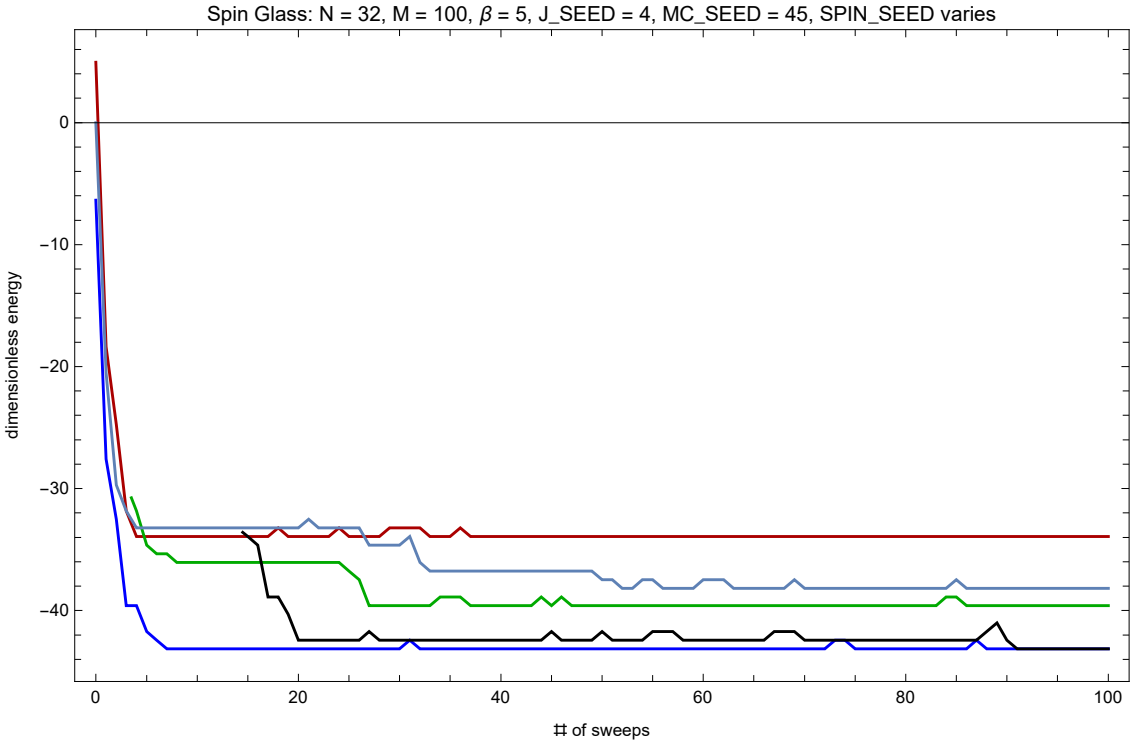
Out[13]=


Spin Glass: N = 32, M = 100, β = 5, J_SEED = 2, MC_SEED = 45, SPIN_SEED varies
dimensionless energy
0
−10
−20
−30
−40
0
20
40
60
80
100
# of sweeps

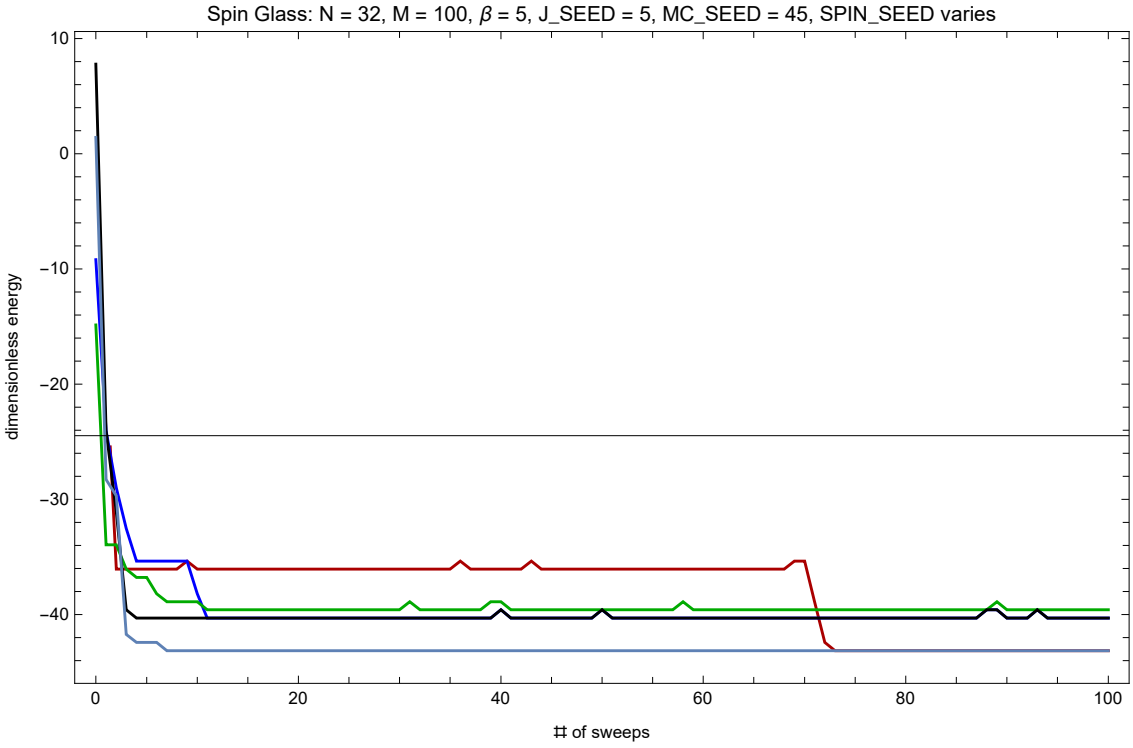
Out[14]=


Spin Glass: N = 32, M = 100, β = 5, J_SEED = 3, MC_SEED = 45, SPIN_SEED varies
dimensionless energy
# of sweeps
10
0
−10
−20
−30
−40
0
20
40
60
80
100

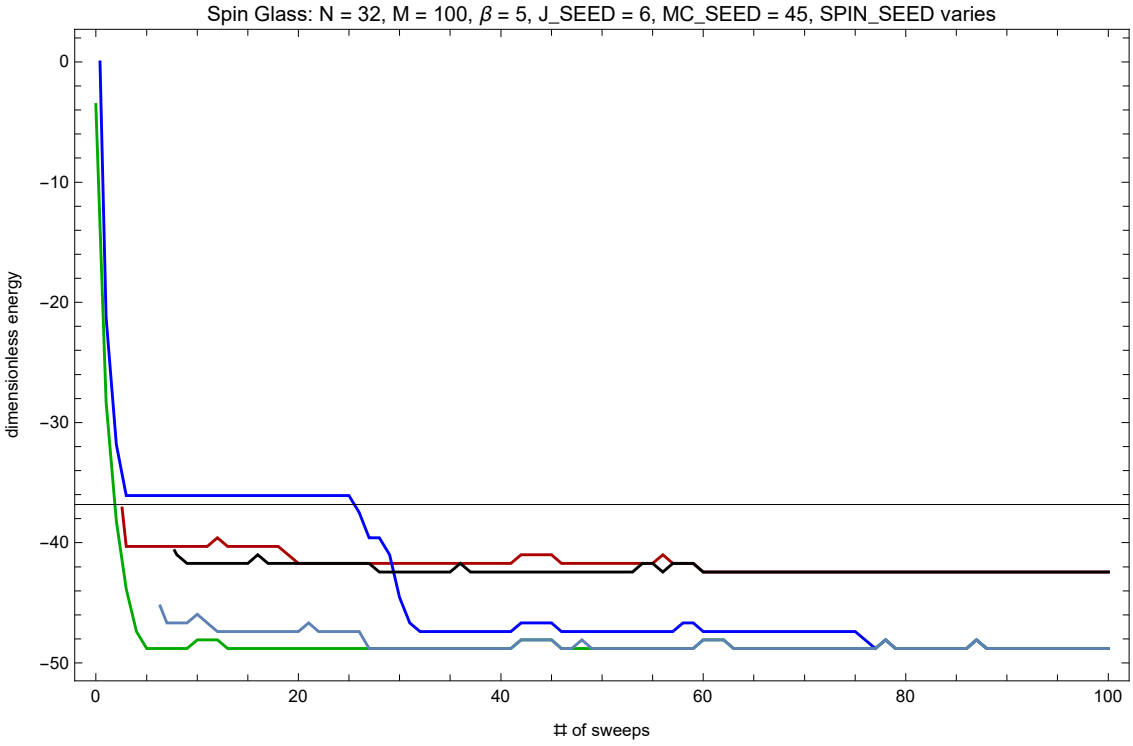
Out[15]=


Spin Glass: N = 32, M = 100, β = 5, J_SEED = 4, MC_SEED = 45, SPIN_SEED varies
dimensionless energy
# of sweeps
0
−10
−20
−30
−40
0
20
40
60
80
100

Out[16]=


Spin Glass: N = 32, M = 100, β = 5, J_SEED = 5, MC_SEED = 45, SPIN_SEED varies
dimensionless energy
# of sweeps
10
0
−10
−20
−30
−40
0
20
40
60
80
100

Out[17]=


Spin Glass: N = 32, M = 100, β = 5, J_SEED = 6, MC_SEED = 45, SPIN_SEED varies
dimensionless energy
# of sweeps
0
−10
−20
−30
−40
−50
0
20
40
60
80
100