

The free energy landscape for the mean field 1D ising model



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- What is significant about the points where the black curve intercepts with the x axis?

 - When the applied field H is equal to 0 at how many points does the black line intercept with the x axis? What happens as the the inverse temperature is increased?

 - Describe the shape of the green curve when $H = 0$ and when (a) $T < 2\frac{k_B T}{J}$ and when (b) $T > 2\frac{k_B T}{J}$. How does the shape of this curve differ in these two regimes? What happens to the derivative of the free energy with respect to $\langle M \rangle$ at $H = 0$ when $T = 2\frac{k_B T}{J}$?

 - What happens to the shape of the green curve when $H \neq 0$. Comment on the behavior of the turning points and the way this number changes with field strength and temperature.

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- Given what you have discussed explain how the magnetization behaves as you move from the $T > 2\frac{k_B T}{J}$ regime to the $T < 2\frac{k_B T}{J}$ regime in the absence of an applied field
- How does the magnetisation behave as the temperature is increased in the presence of an applied magnetic field?