The mean field approximation

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- Explain how the Hamiltonian for the Ising model can be approximated using the mean field approximation.

- Explain why approximating the Ising model Hamiltonian in this way simplifies the calculation of the partition function

- Write out an expression for the partition function of the Ising model when it is calculated using the mean field approximation.

- Explain how one can calculate the average spin term $\langle S \rangle$ that appears in the expression for the partition function that you have just written out by taking suitable derivatives of the partition function

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- Write out an expression for the average spin that involves the tanh function