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mathematics

# Phase transitions in the Ising Model

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- Explain the meanings of the terms first order phase transition and continuous phase transition
- Explain how statistical mechanics shows that finite sized systems do not exhibit phase transitions
- Explain the meaning of the term thermodynamic limit
- Explain why the free energy of the Ising model is given by  $F = -k_B T \ln \lambda_1$  in the thermodynamic limit. In this expression  $\lambda_1$  is the principle eigenvalue of the transfer matrix



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- Derive an expression for the average magnetisation of the Ising model in the thermodynamic limit
- Explain how the magnetic susceptibility is calculated and derive an expression for this quantity for the Ising model in the thermodynamic limit.
- Discuss the behavior of the susceptibility of the Ising model as the temperature goes to zero and whether or not this behavior is indicative of a phase transition.