

# Three lectures on basic applications of statistical mechanics.

Suitable lecture notes for this part of the course:  
Prof J. Devriendt

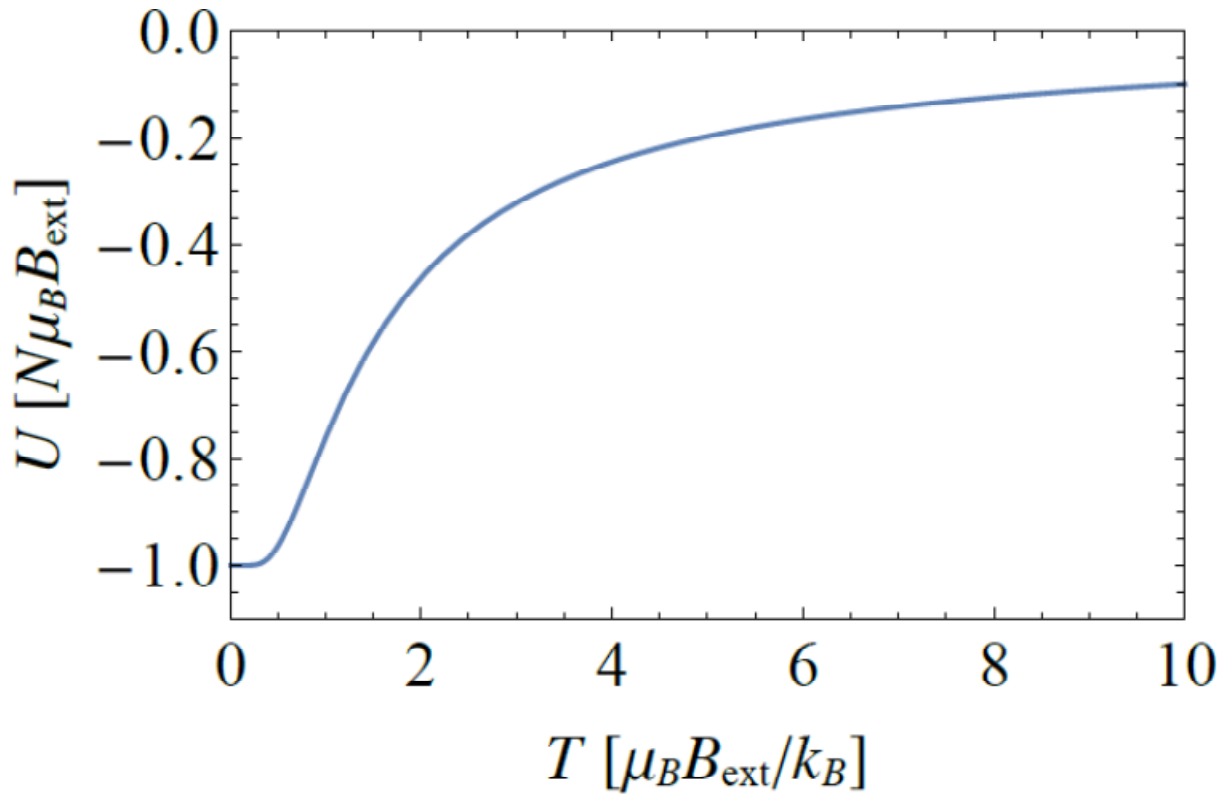
- <https://www.physics.ox.ac.uk/our-people/devriendt/teaching>

sections 8,9,10.

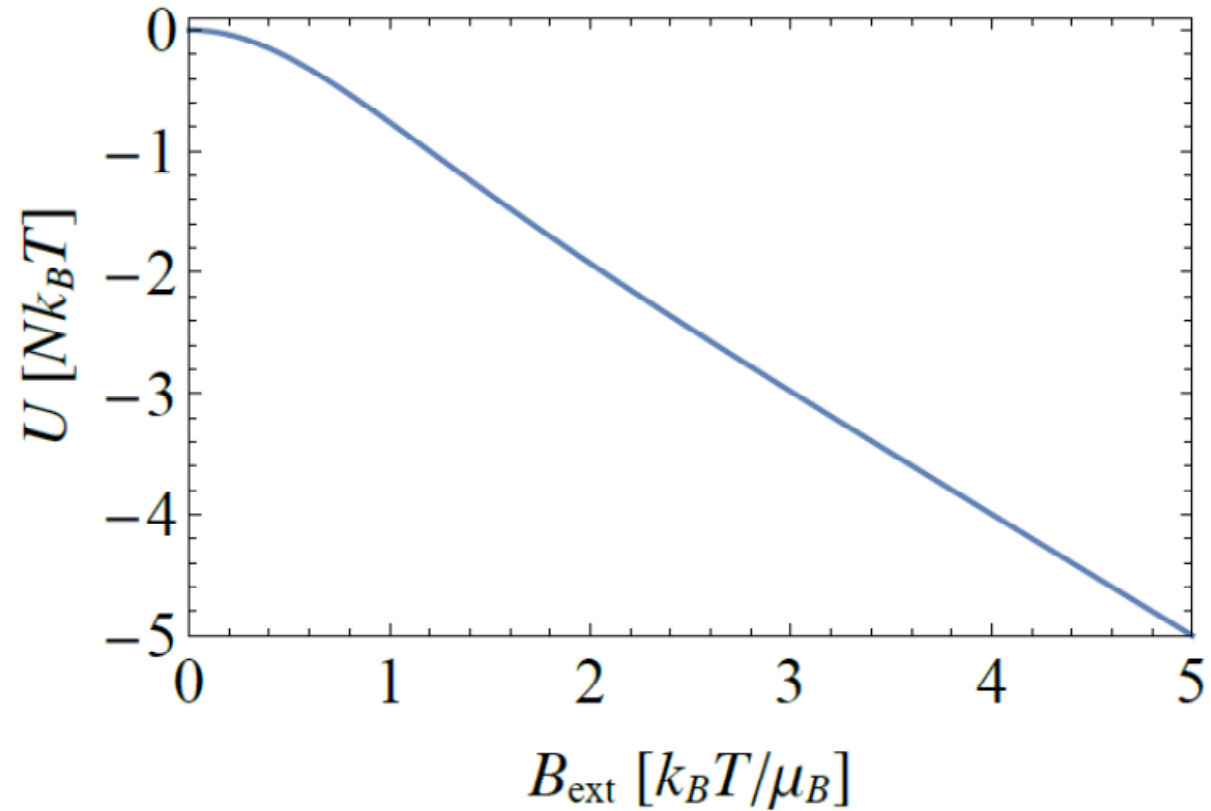
The graphs and illustrations in these lectures are mostly taken from these notes (with permission).

# This lecture: The paramagnetic solid

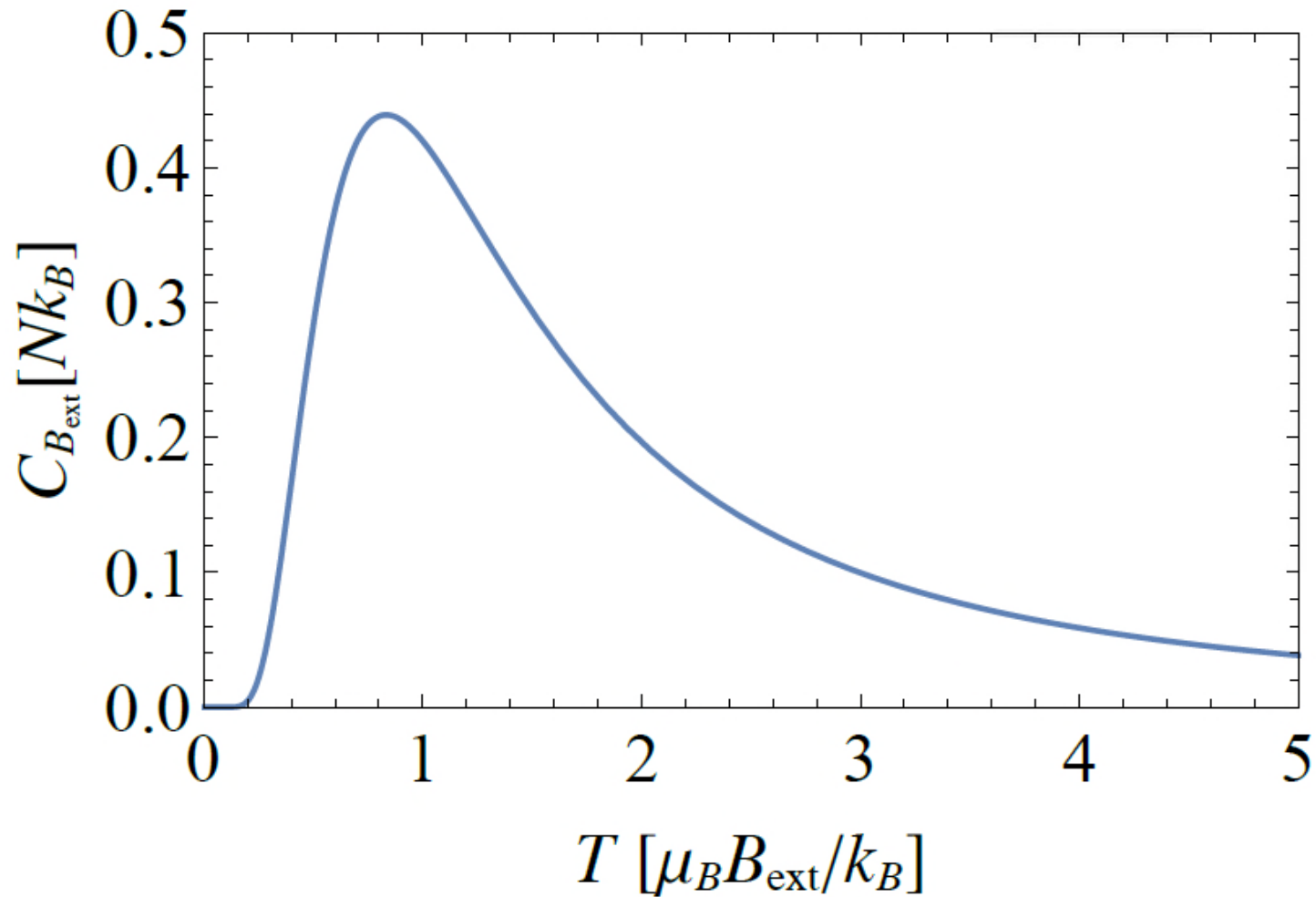
1. Review some basic results/concepts
2. Look at two-state system, e.g. spin-half paramagnetic solid.



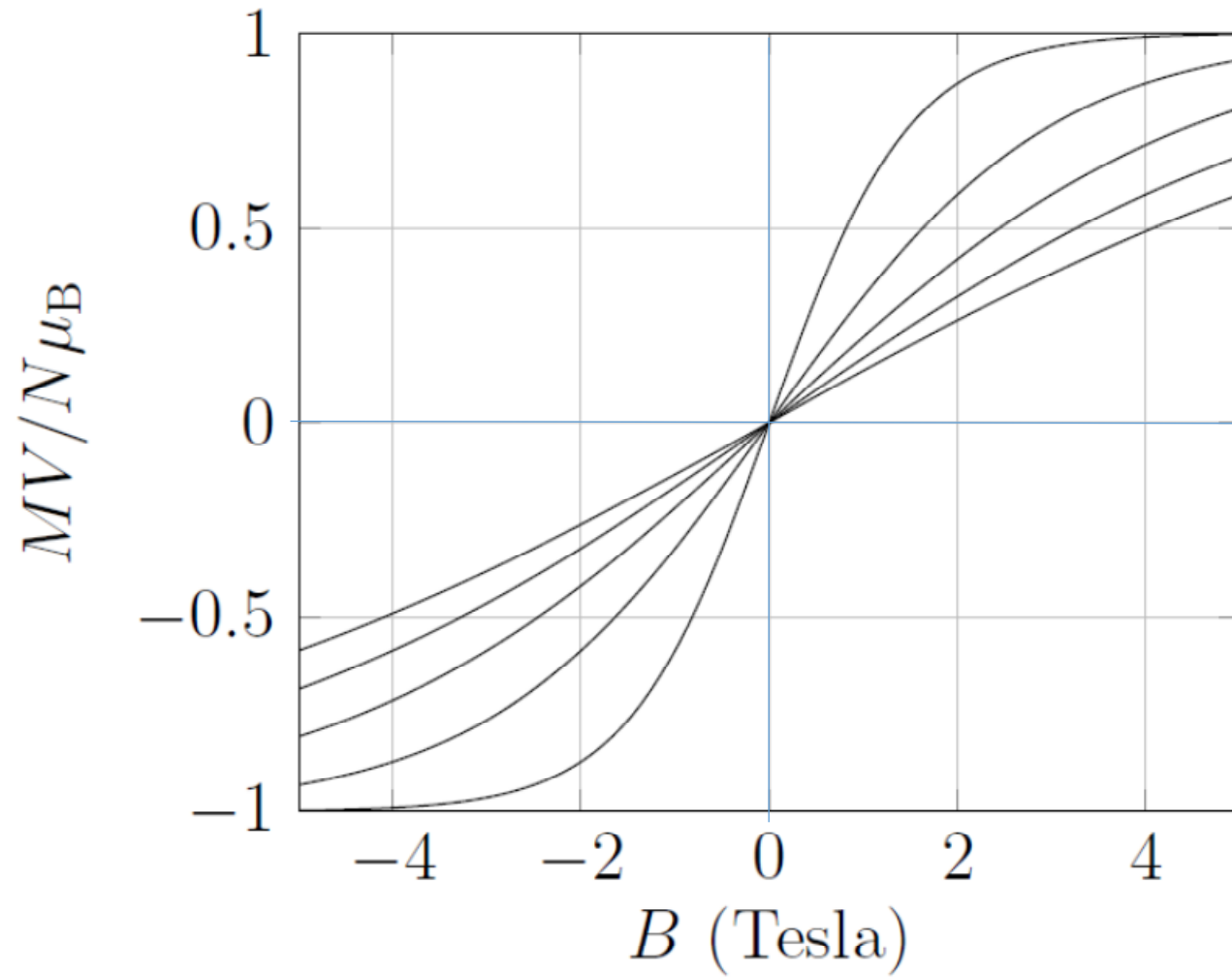
Internal energy of a spin-half paramagnet as a function of temperature.



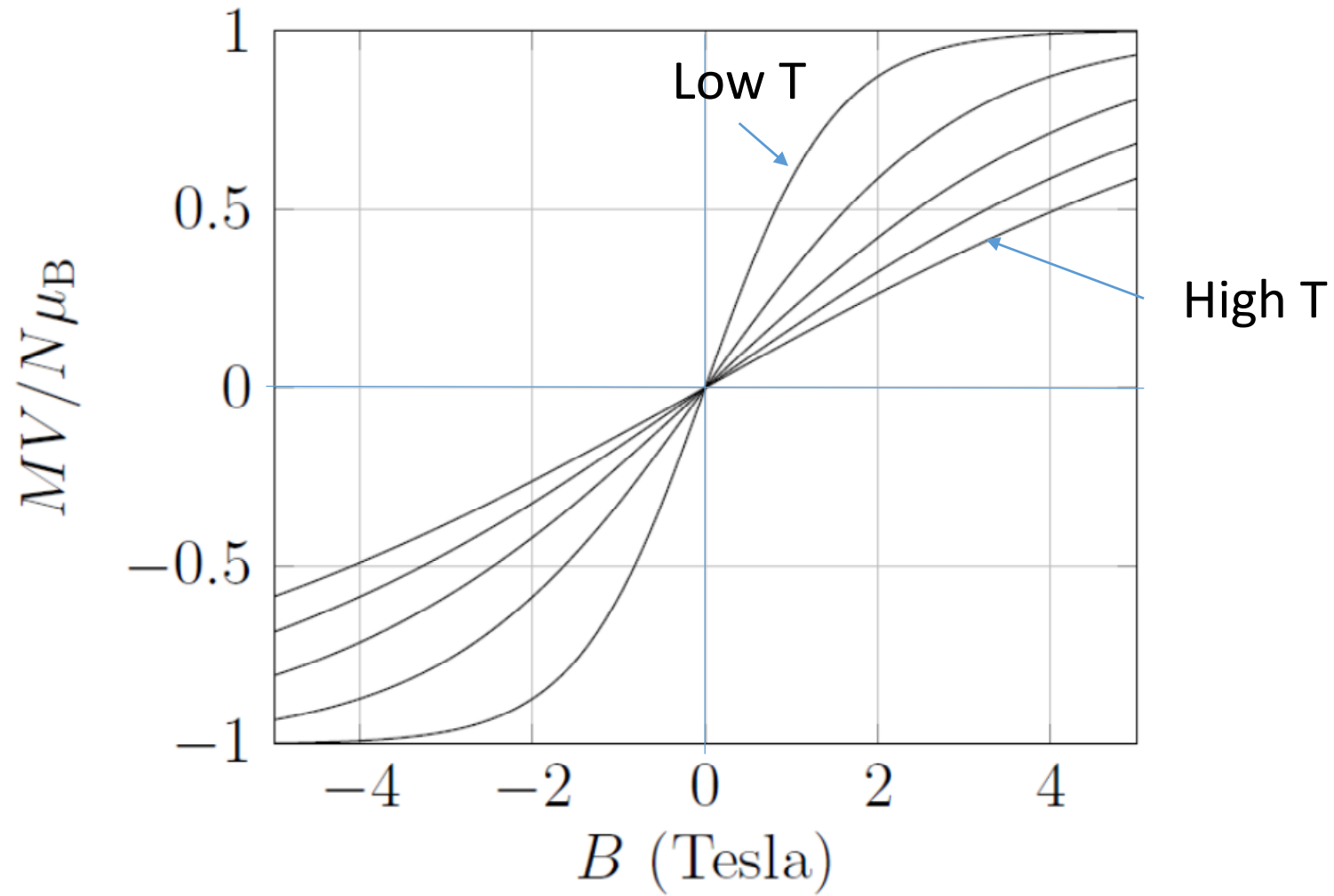
Internal energy of a spin-half paramagnet as a function of applied magnetic field.



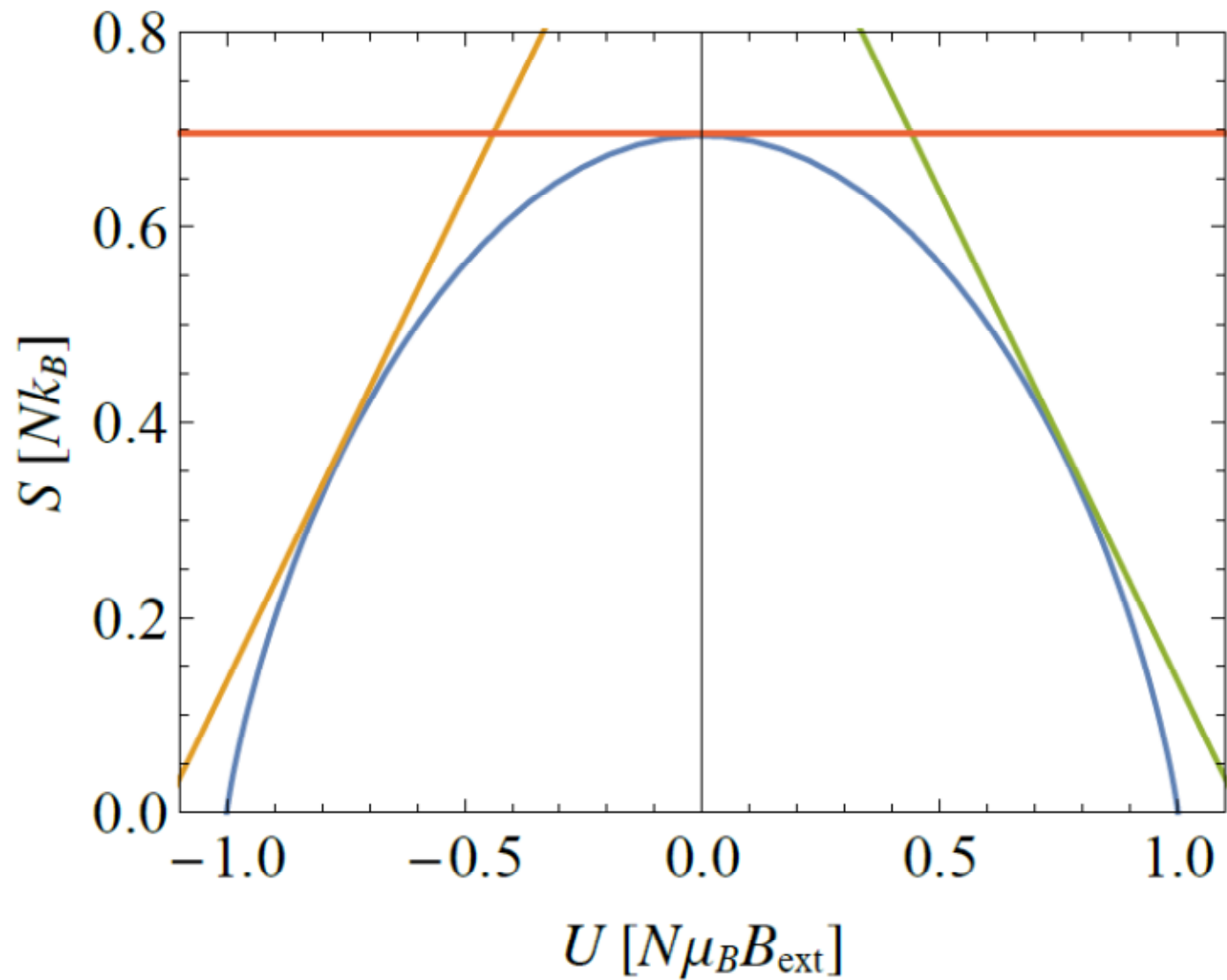
Heat capacity of a spin-half paramagnet as a function of temperature.  
(This functional form or shape is called a “Schottky anomaly”)



Magnetization as a function of applied magnetic field, for temperatures 1 to 5 kelvin.



Magnetization as a function of applied magnetic field, for temperatures 1 to 5 kelvin.



Entropy of a paramagnet as a function of internal energy.

The straight lines give three examples of the slope ( $dS/dU$ ).