

Physics 540: Statistical Mechanics I

Read: LL 32

“LL 1” means section 1 from Landau and Lifshitz book

Homework 6

Exercise 1

A classical 1d oscillator at temperature T has an anharmonic potential $V(x) = \frac{1}{2}m\omega^2x^2 + \frac{1}{3}\beta x^3 + \frac{1}{4}\gamma x^4$. Considering β and γ small, find corrections of the lowest non-zero order in β and γ to the (i) free energy, (ii) specific heat, and (iii) the mean coordinate value at temperature T .

Exercise 2

There is a three-level system with $E_1 < E_2 < E_3$ and $E_2 - E_1 \ll E_3 - E_2$. Find occupations $\bar{n}_{1,2,3}$, entropy S , and specific heat C as a function of T . Plot $C(T)$ for $E_1 = 0$, $E_2 = .2$, $E_3 = 1$.