Condensed Matter Physics 2013
Exercise 6

handed out: 22. Oct. 2013 discussion: 29. Oct. 2013

Problem 23

Calculate the reflection coefficient $R(\omega) = \left|\frac{n_2-n_1}{n_2+n_1}\right|^2$ for $k \to 0$! Start from the expression for $\chi(\omega)$ given in the script on page 3.19 (you can use a computer algebra program, if you want to).

*Problem 24 (2P)

Determine the spectra of a 2 dimensional harmonic oscillator with potential $U = \frac{m\omega^2(x^2+y^2)}{2}$. What is the degeneracy of the first 5 eigenstates? Write down the corresponding quantum numbers of each state.

* Problem 25(2P)

Show that the phonon density of states in the Debye model is given by $\omega_D = \pi cN/L$ in the 1D case !

* Problem 26 (2P)

Calculate the specific heat c_v of one harmonic oscillator coupled to a heat bath at temperature T. How does c_v look like in the limts: $T \to 0$ and $T \to \infty$?