

## Physics 308: Assignment 3

Due in class Thursday, January 31, 2008

1. Surface waves on liquid helium have energy

$$\epsilon(k) = \hbar \sqrt{\frac{\sigma k^3}{\rho}}, \quad (1)$$

where  $k$  is the wavenumber of the surface wave,  $\sigma$  the surface tension, and  $\rho$  the mass density of the liquid. Treating the excitations as bosons with no number conservation, find the internal energy per unit area as a function of temperature.

2. 8–26 from *Modern Physics*, pg. 386
3. 8–31
4. 10–16 pg. 502
5. 10–47 pg. 504