Thermal Physics

Problem Set 5

1. Chapter 3, p. 84, problem 6 (5 pt)

2. Chapter 3, p. 85, problem 7 (5 pt)

3. In the Problem Set 1 we used that the probability density of a classical harmonic oscillator of mass m and angular frequency ω to be at a distance q from the minimum of the potential energy is

$$p(q) = C \exp[-m\omega^2 q^2/2k_B T],$$

   where T is temperature and k_B is the Boltzmann constant, $k_B T \equiv \tau$. Using the Boltzmann distribution for a classical harmonic oscillator, prove that this expression is correct (6 pt)

You need to have 10 points out of 16 (6 points are extra credit).

The problems are from Kittel & Kroemer, *Thermal Physics*, 2nd edition, (Freeman, NY 1980).