

Physics 410 - 2003

# Thermal Physics

## Problem Set 2

1. Problem 4, Chapter 2 (5 pt)
2. Consider a system of  $N = 10^{10}$  spins, each with a magnetic moment  $m = e\hbar/(2m_e)$  ( $e$  and  $m_e$  are the electron charge and mass), in a magnetic field  $B = 1$  T. Assume that, as a result of interaction, each energy level  $-2msB$  ( $s$  is the spin excess) is split, so that the energy levels of stationary states fill the gap  $2mB$  uniformly. For  $s = N^{1/2}$  what is the interlevel distance? From the energy-time uncertainty relation estimate the time it will take to determine whether the system is in a stationary state (6 pt)
3. Problem 2, Chapter 2 (6 pt)
4. Problem 6, Chapter 2 (5 pt)

You need to have 20 points out of 22 (2 points are extra credit).

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