Ph 340 – Problem Set 12 – Spring 1997

1. In two space dimensions compute $[H, L]$, where
$$H = (p_x^2 + p_y^2 + x^2 + y^2)/2$$
and
$$L = xp_y - yp_x.$$
(Take $\hbar = 1$.)

2. Solve the scaled $(m, \hbar = 1)$ spherical harmonic oscillator problem
$$H = (p_x^2 + p_y^2 + p_z^2 + x^2 + y^2 + z^2)/2$$
in two ways, finding the energies and eigenstates in both cases:
   (a) In Cartesian coordinates.
   (b) In spherical coordinates. (You need only find the results for the ground state and the first excited state in this case.)