Phys 521 Quantum Mechanics I **Fall 2011**

Homework Assignment #5 **Due Tuesday, November 1**
(40 points) **(at lecture)**

5.1 (10 points) Challenge problem (a). C-T M_V.2.

In a three-dimensional problem, we consider a particle of mass m and potential energy

$$V(X,Y,Z) = \frac{m\omega^2}{2}\left[\left(1+\frac{2\lambda}{3}\right)(X^2+Y^2) + \left(1-\frac{4\lambda}{3}\right)Z^2\right] ,$$

where ω and λ are constants that satisfy

$$\omega \geq 0 , \quad 0 \leq \lambda < \frac{3}{4} .$$

(a) What are the eigenstates of the Hamiltonian and the corresponding energies?

(b) *Calculate* and *discuss*, as functions of λ, the variation of the energy, the parity, and the degree of degeneracy of the ground state and the first two excited states.