1. Calculate the energy of the ground state of a particle in a 1D harmonic oscillator potential including the relativistic correction to the dispersion relation to lowest order in perturbation theory.

2. Consider an electron in a 3D harmonic oscillator potential $V(r) = \frac{1}{2}m\omega^2 r^2$. Find the energies of the eight lowest energy states treating the spin-orbit interaction to lowest order in perturbation theory.

3. Sakurai problem 5.7

4. Sakurai problem 5.13

5. Sakurai problem 5.16