1. **Relativistic Harmonic Oscillator**: A particle of mass $\mu$ moves in a one-dimensional harmonic oscillator potential $V(x) = \frac{1}{2}\mu\omega^2x^2$. Allowing for relativistic effects, the kinetic energy is $T = E - \mu c^2 = \sqrt{\mu^2c^4 + p^2c^2} - \mu c^2 \approx \frac{p^2}{2\mu} - \frac{p^4}{8\mu^3c^2}$. Treating the $p^4$ term as a perturbation, calculate the first order shift in the ground state energy.

2. Problems 17.3.2, 17.3.4 and 18.2.2 in Shankar’s book.