

November 15, 2023

1. Consider the polarization of a harmonic oscillator. The Hamiltonian reads

$$\hat{H} = \hat{H}_0 + \hat{V} = \frac{\hat{p}^2}{2m} + \frac{1}{2}m\omega^2\hat{x}^2 - e\hat{x}E \quad (1)$$

with E being the external constant electric field. Calculate the energy shift of the ground state to lowest nonvanishing order. Solve this problem exactly and compare with your result obtained by the perturbation theory.