1. Use finite differences to calculate the eigenvalues and eigenvectors (wavefunctions) for the electron in the harmonic oscillator potential. Plot the particle probability densities of the 3 lowest states \((n=0,1,2)\) and compare the analytic eigenvalues to the calculated results for \(n<10\). Reproduce the comparison between the harmonic oscillator particle probability density and the classical prediction for \(n=9, 49, \text{ and } 99\). Show how the classical prediction gets better as \(n\) increases. (Use \(\omega=1e15\) rad/sec.)

2. Griffiths 2\textsuperscript{nd} ed. problems 2.14 and 2.15 (Hint for 2.14: the wavefunction is no longer an eigenfunction of the Hamiltonian!)