Problem 1 – particle in a box basis set
Choose a function that you wish to model using the particle in a box basis set functions. Choose something you find interesting and that is distinct from each other student in the class. Show how well the particle in a box basis is able to mimic your function, as you use more and more basis set functions. Try to make an animated gif to illustrate this, or otherwise just make multiple plots. As an (optional) challenge, repeat using the harmonic oscillator wavefunctions as the basis set.

Problem 2 – perturbation theory
Following the lecture notes from class on perturbation theory, work out (and plot) the first order perturbation correction to the reference wavefunction for the ground state and the first excited state for a perturbation to the particle in a box problem. Choose a perturbation you find interesting and that is distinct from each other student in the class. As an (optional) challenge, repeat using the harmonic oscillator at the reference state.