Physics 492: Recitation #10
April 6, 2017

1. Show that the first order correction to the ground state of hydrogen due to the Stark effect (electric field) vanishes. Show that the only non-vanishing $n = 2$ matrix elements are $\langle 2, 1, 0|\hat{H}_1|2, 0, 0\rangle = \langle 2, 0, 0|\hat{H}_1|2, 1, 0\rangle$.

2. Use the variational method and a triangular wave function to estimate the ground state of an infinite 1-D square well. Recall that the derivative of a unit step function is a δ-function. Compare to the exact answer.

3. In the initial Rutherford scattering experiment Geiger and Marsden used α particles with an energy of 5 MeV off of Gold ($Z = 79,\ A = 197$) foil. Calculate the classical distance of closest approach for zero impact parameter scattering, ignoring the electrons. Compare this to the nuclear radius.