1) A particle in an infinite square well (0 \leq x \leq L) is initially in the state,
|\psi(t = 0)\rangle = \frac{1}{\sqrt{2}}(|\phi_1\rangle - i|\phi_2\rangle). (a) Compute the average position as a
function of time, \langle X \rangle (t). (b) Compute the average force applied using
m\frac{d^2}{dt^2} \langle X \rangle (t) = \langle F \rangle (t) and rewrite the force as a function of \langle X \rangle.
Does this result make sense?
2) A hydrogen atom in its ground state is bound because of the Coulomb interaction, $-\frac{\alpha \hbar c}{r}$. (a) What is the average potential energy for the ground state, $\langle -\frac{\alpha \hbar c}{r} \rangle$? (b) What is the average kinetic energy, $\langle \frac{p^2}{2m} \rangle$?