Homework 8, Due April 1

1. What is the band origin (the first line) of the Paschen series (n_1=3 to n_2=4) of the H atom in wave numbers? What would be the wavelength of a photon that is needed to ionize the ground state H atom?

2. Compute the expectation value of the radius operator $\left\langle \Psi | \hat{r} | \Psi \right\rangle$ for the 1s orbital of the H atom. Express it in the Bohr radius (a_0).

3. The 1s and 2s orbitals of the H atoms are eigenfunctions of the corresponding Hamiltonian, which is Hermitian. As a result, they should be orthogonal. Prove it with the explicit functional forms of the two orbitals.