Phys 402: Applications of Quantum Mechanics

Homework VI (Total 3 problems; due 930am, Thursday, March 10, 2016]
[To receive full credits, please show all necessary steps that lead to your answers.]

1) Prob. 7.3 (Page 298, textbook.)

2) Prob. 7.4 (This is for an excited state. practically variational method rarely used for such a purpose.)

3) Prob. 7.5

4) Use the variational method to obtain the hydrogen atom ground state. Compare with the exact expression on Page 149, Eq. [4.69] and the expression for Bohn radius Eq. [4.72]. Discuss similarities and differences. Hint: You can use a simple exponential function as the trial wave function Instead of the Yukawa form.

5) Further check the ratio between the kinetic energy and potential energy at the variational minimum you have found in 4). Does it satisfy the general relation between the kinetic energy and potential energy implied by Feynman-Hellmann theorem in Prob. 6.32, page 288 ?