

PHYS 452: Quantum Mechanics II (Spring 2015)
Homework #4, due Thursday February 26, in class

1. Problem 6.40 in Griffiths.
2. Estimate the speed of the electron in the ground state of the hydrogen atom and compare it to the speed of light (e.g. provide a numerical answer for the ratio $\frac{c}{v}$).
3. Problem 6.21 in Griffiths.
4. Using the WKB approximation estimate the transmission and reflection coefficients for the potential barrier

$$V(x) = \begin{cases} V_0 \left(1 - \frac{x^2}{a^2}\right) & , |x| < a \\ 0 & , |x| > a \end{cases} .$$

5. Consider a quantum particle of mass m moving in the field of the potential $V(x) = \alpha|x|$, where α is a positive constant. Use the WKB approximation to find the energies.
6. (Bonus problem; You do not have to do it if you do not want to) Problem 6.15 in Griffiths.