Homework March 5, 706, Spring 2009, due: March 12

1) Problem 14 of chapter 2 of Sakurai.

2) Problem 16 of chapter 2 of Sakurai. The state you construct in part (a) has to be normalized! So, a state $a|0\rangle + b|1\rangle$ has $a^*a + b^*b = 1$.

3) Problem 22 of chapter 2 of Sakurai. [Hint: integrate the Schrödinger equation for this problem between $-\epsilon$ and ϵ, and take $\epsilon \to 0$ to find a boundary condition on $d\psi/dx$ at $x = 0$.]

4) Use the WKB approximation to find the allowed energies of the general power-law potential:

$$V(x) = \alpha|x|^\nu \,,$$

where ν is a positive number. Check your result for the case $\nu = 2$! [You are allowed to use Mathematica, or an integral table, but you have to show how you used it.]