Quantum Mechanics Homework Week 3

For Monday 9/17, reread Griffiths' section 2.3.1 and turn in by 9:30 am:

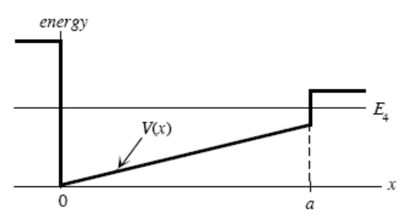
1. In words, explain the concept and usefulness of ladder operators.
2. What the heck is a hermitian conjugate?
3. In the last weekly homework problem, you are asked to find <T>+<V>. What do you expect this to be and why?
4. Turn in #2-3 from last Friday and make a good attempt at the weekly hw.

"For realz" weekly homework due 9:30 am on Wednesday 9/19 is math problems from 9/12 and 9/14.

For Wednesday 9/19, read Griffiths' section 2.3.2 and Q10.6 and turn in by 9:30 am:

1. Easy Math: Construct the third thru fifth excited states of the harmonic oscillator using Hermite polynomials.
2. Fill in: Show explicitly that equation 2.75 satisfies 2.74.
3. Conceptual: Go back and do problem Q10B.7 using Schrosolver.
4. Math: Compute <*x*> for ψ_5 and compare to value from problem last math problem from last Friday.
5. Math: A particle in the harmonic oscillator has the initial wave function:
   $$\Psi(x,0)=\frac{1}{\sqrt{2}}[\psi_0+\psi_2]\ .$$
   a. Compute <*x*>.
   b. If you measured the energy of this particle, what values might you get, and what is the probability of getting each of them?

For Friday 9/21, read Griffiths section 2.4 and Q11 and turn in by 9:30 am:



1. Conceptual: The graph shows the potential energy as a function of position for a certain quanton. What should the eigenfunction corresponding to the fourth energy level look like? Why? Be specific.
2. Fill in: Show that eq. 2.92 satisfies eq. 2.90.
3. Math: A free particle has the initial wave function $\Psi(x,0)=Ae^{-a|x|}$, where *A* and *a* are positive real constants.
   a. Normalize $\Psi(x,0)$.
   b. Find $\phi(k)$.
   c. Construct $\Psi(x,t)$ in the form of an integral.