AQM-2013f HW2

Equation numbers and page numbers refer to Griffith.

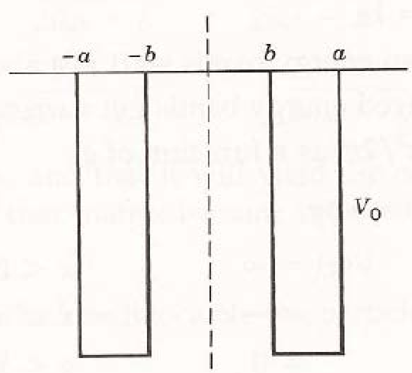
1. If V(-x)=V(x), show that if ϕ(x) is a solution of the Schroedinger equation, then ϕ(-x) is also a solution. Thus ϕ(x) ± ϕ(-x) (even and odd) are also solution.
2. If V(x)=$\frac{1}{2}\, m\omega^2(x-x_0)^2$. Is V(x) symmetric? Find the ground state energy and wavefunction of this potential. [Do not solve it again. Just use answers from book]
3. For the harmonic oscillator, H= T +V. Find the average values <T> and <V> for state |n>. It is easier to calculate the matrix elements using the operator method. See examples on page 49 of Griffith.
4. Problem 2.14 on page 51.
5. Problem 3.34 on p. 127.
6. Problem 2.33. You should begin with eq. (2.169). Sketch the transmission coefficients for energy E from below the barrier to above the barrier V_0.

~~16~~7. Consider a particle in the double well shown in the figure. Show that the eigenvalue conditions may be written in the form

$$\tan q(a-b) = \frac{q\alpha(1+\tanh \alpha b)}{q^2-\alpha^2 \tanh \alpha b}$$

and

$$\tan q(a-b) = \frac{q\alpha(1+\coth \alpha b)}{q^2-\alpha^2 \coth \alpha b}$$



for the even and odd solutions, respectively, where $-E = \hbar^2\alpha^2/2m$ and $E + V_0 = \hbar^2 q^2/2m$.

END

7. ~~Continue on the previous problem. In the basis set {|0>, |1>, |2>, …} of the eigenstates of the oscillator, T and V~~