FINAL TEST
S-1 QUANTUM PHYSICS
PHYSICS EDUCATION, UM
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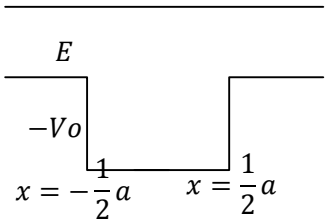
1. A particle of mass m is trapped in a one dimensional box of width a. The wave-function is
   $$\psi(x) = \frac{i}{2}\sqrt{\frac{2}{a}}\sin\left(\frac{n\pi x}{a}\right) + \sqrt{\frac{1}{a}}\sin\left(\frac{3\pi x}{a}\right) - \frac{1}{2}\sqrt{\frac{2}{a}}\sin\left(\frac{4\pi x}{a}\right)$$
   If the energy is measured, what are the possible result and what is the probability of obtaining each result? What is the most probable energy for this state?
2. Suppose that $V(x) = -V\delta(x)$, where V > 0,
   a. Let E < 0 and find the bound state wave function and the energy
   b. Let an incident beam of particles with E > 0 approach from the direction of x =-∞ and find the reflection and transmission coefficients.
3. a. Suppose that the ground state wave function of the harmonic oscillator
   $$\psi_0(x) = \left(\frac{m\omega}{\pi\hbar}\right)^{\frac{1}{4}}\exp\left(-\frac{m\omega}{2\hbar}x^2\right)$$ is normalized.
   b. If a harmonic oscillator is in this state, find the probability that the particle can be found in the range $0 \le x \le 1$.

4. The wave function for a particle confined to $0 \le x \le a$ in the ground state was found to be:
   $$\psi(x) = A\sin\left(\frac{\pi x}{a}\right)$$
   where *A* is the normalization constant. Find *A* and determine the probability that the particle is found in the interval $\frac{a}{2} \le x \le \frac{3a}{4}$
5. A particle of mass (m) is trapped in potential well with depth of potential is Vo. The well of potential have ranged between x = -½ a dan x = ½ a. The energy of particle is E.



   a. Determine of reflection and transmission coefficient.
   b. Suppose that R + T = 1