Problem 1

For a very heavy particle the propagator between two places is $P_0(r_1, r_2)$ is one over the mass, i.e. $P_0(r_1, r_2) = \frac{\delta_{r_1, r_2}}{m_0}$, where $m_0$ is the mass and $\delta_{r_1, r_2}$ satisfies $\delta_{r_1, r_2} f(r_1, r_2) d\mathbf{r}_1 = f(r_2, r_2)$. This particle, the fat electro, is now placed in a medium in which there are two things that can happen to it, a dink with probability $d_i d_{\mathbf{r}_1, \mathbf{r}_2}$ and a dank $d_a d_{\mathbf{r}_1, \mathbf{r}_2}$. What is the propagator for the fat electro in the medium? (5 points) What is the effective mass of the fat electro in this medium? (5 points)

Solution

Problem 2

Consider the particle in the infinite well. The well width is $a$ and particle mass is $m$. When the particle is in any of the stationary states, what is the the expectation value of the velocity? (5 points) What is the expectation value of the energy? (5 points) What is the expectation value of speed? (5 points) What is the uncertainty in the velocity? (5 points) What is the uncertainty in the speed? (5 points) What is the uncertainty in the position? (5 points)

Solution

Problem 3

In the potential well $V(x) = \frac{k}{4} x^4$, we expect bound states. What do we anticipate for the energy of the ground state? (10 points)

Solution