Chem 2430 - HW #1
Assigned 9/1/2021, Due 9/9/2021

1. Assume that the wavefunction of a system is $\psi = e^{-ax^2} + x e^{-ax^2}$ and that x extends from $-\infty$ to ∞

a) What is the normalized wavefunction?

b) What is the probability of finding the particle between $x = -1$ and $x = +1$?

c) Are e^{-ax^2} and $x e^{-ax^2}$ orthogonal on $(-\infty, \infty)$? on $(0, \infty)$?

2. Consider the wave function $\psi = Ae^{ikx} + Be^{-ikx}$ for the system with $V = \infty$, $x \leq a$ and $V = 0$, $x < a$.

a) Determine A and B.

b) Derive the energy of this system.

3. What is the zero-point energy of an electron in a 1D box of length 10 Bohrs? Give your result in electronvolts.