PHY407: Lab 9

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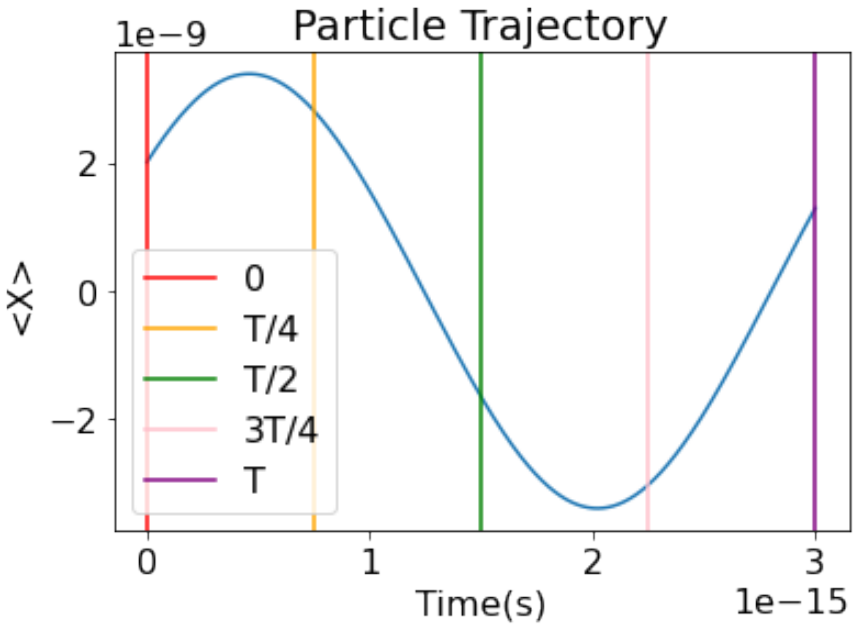
Work Distribution: We worked on this assignment together in-person, so it was split quite evenly. We brainstormed pseudocodes, and then the base code for each question was collaborated upon. We reused the code we wrote as necessary to answer all of the questions. We alternated between parts for these questions, and then switched and checked each other's work at the end.

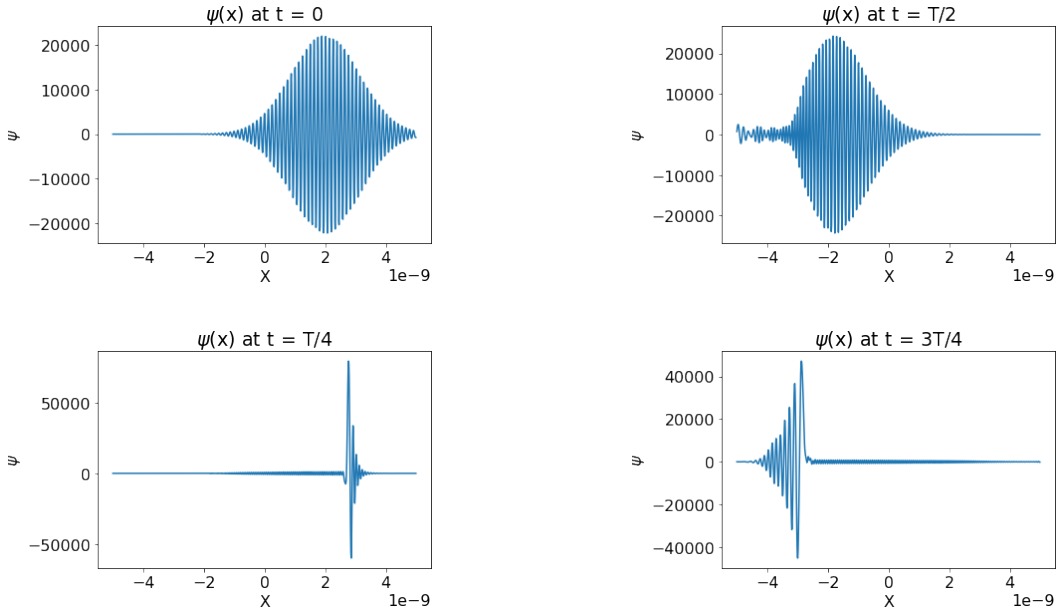
*All Python code and outputs are included in the Quercus submission as .py files.

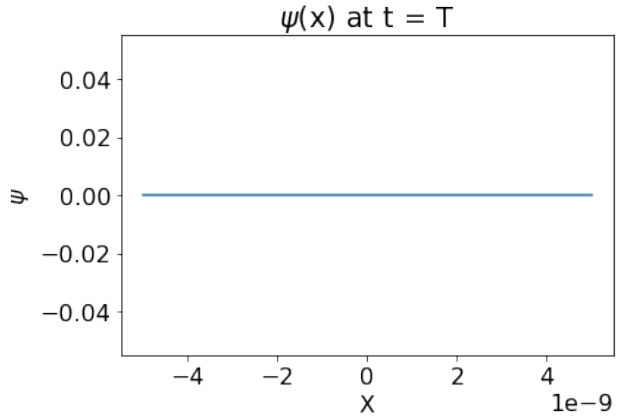
Question 1: Time-Dependent Schrodinger Equation

a) Python code (submitted as .py files)

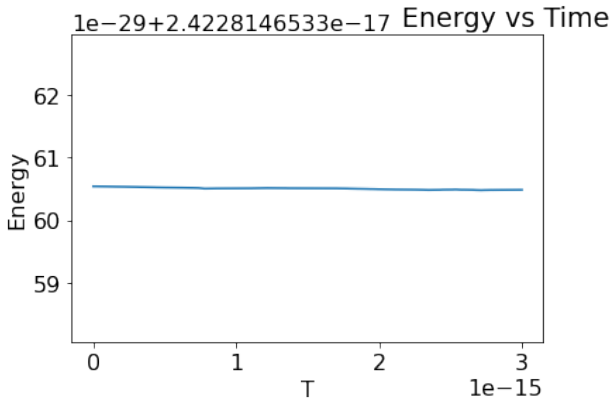
b) Plots

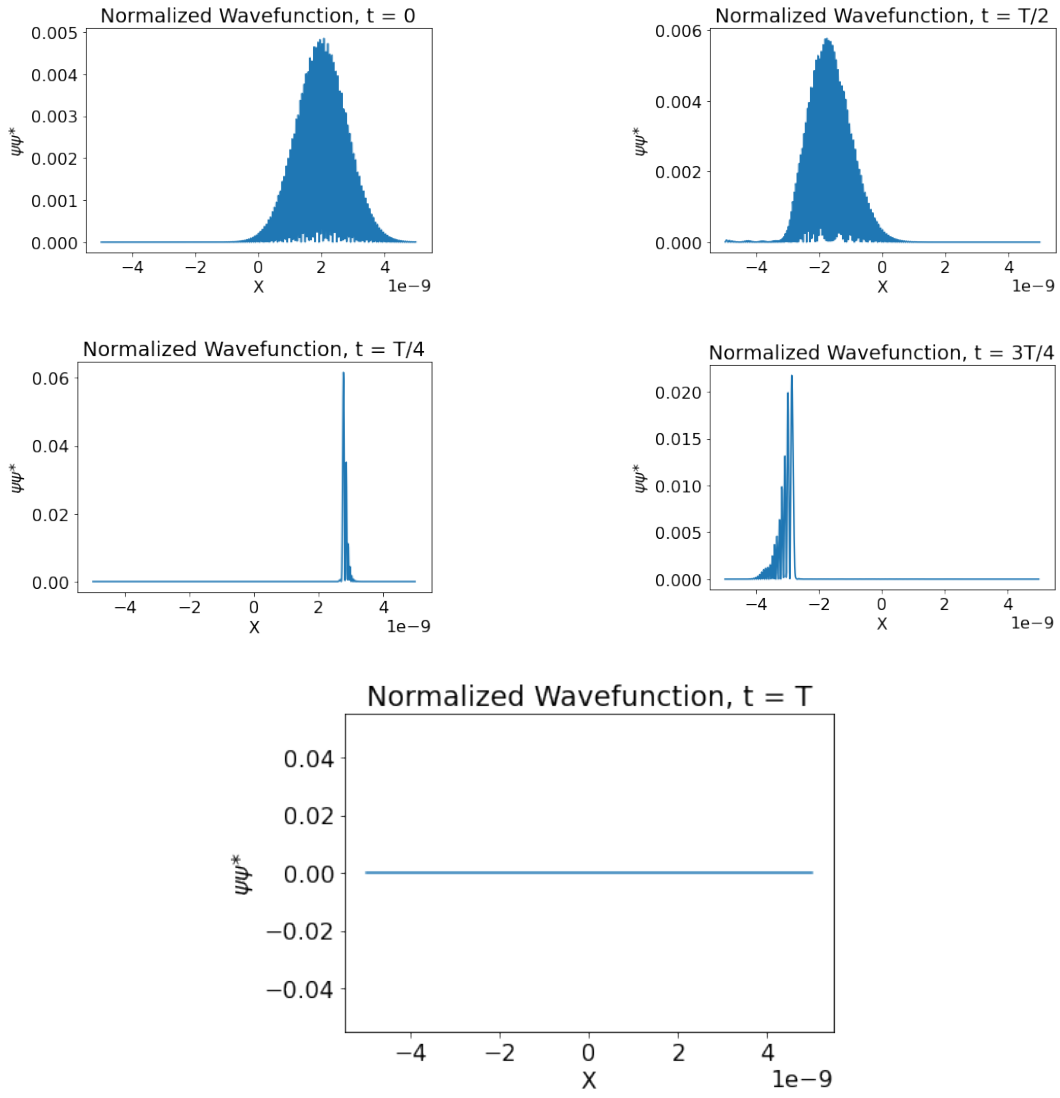



ψ(x) at t = 0
ψ(x) at t = T/2
ψ(x) at t = T/4
ψ(x) at t = 3T/4
ψ
X
1e−9


ψ(x) at t = T
ψ
X
1e−9

c) Plots


1e−29+2.4228146533e−17 Energy vs Time
Energy
T
1e−15



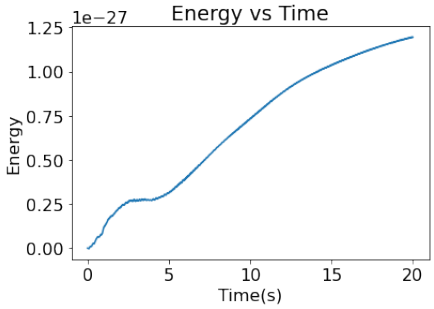
Question 2: Resonant EM Cavity

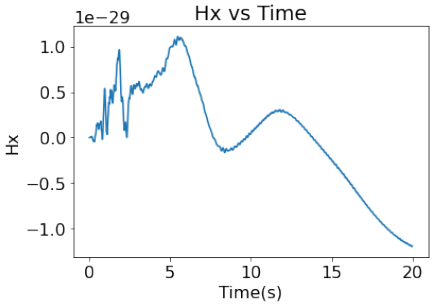
a) Test printout

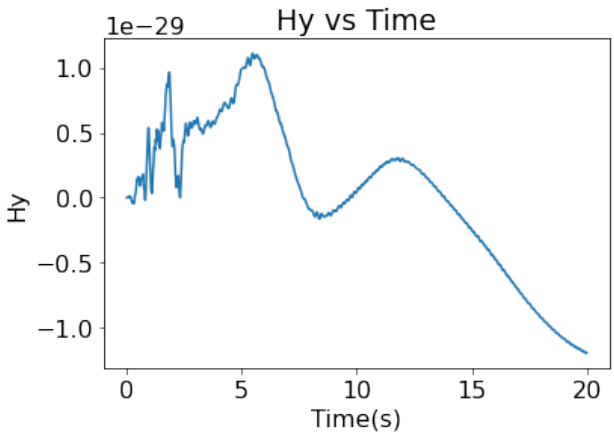
```
F = np.array([[0,3,3],[0,3,3],[0,3,1]])
F_fft = dCSt2(F)
F_ifft = idSCt2(F_fft)
F_ifft
```

```
array([[0., 3., 3.],
       [0., 3., 3.],
       [0., 3., 1.]])
```

b) Code and plots







c) Written explanation

As seen in the plots provided in part b, the energy is slightly increasing. This is expected as the energy will increase as a particle moves from the boundary toward the center of the cavity. The Hy and Hx plots oscillate for a bit and then converge to a negative value. A pattern is difficult to identify given that the scale is of magnitude 1e-29.