Physics 4321/7305 Professor Scalise
Homework Assignment #8 Spring 2020

4321

1. Numerically solve the time-independent Schrödinger equation for the one-dimensional quantum harmonic oscillator potential like we did in lecture but for the first excited state (which is odd, so choose the appropriate boundary conditions). Use the first-order forward Euler method with a stepsize $h = 0.01$ and find the dimensionless energy eigenvalue ϵ to at least eight significant figures. Use any programming language that you wish. Plot the wavefunction, $f(u)$ which is a proxy for $\psi(x)$.

7305

1. Numerically solve the time-independent Schrödinger equation for the one-dimensional quantum harmonic oscillator potential like we did in lecture but for the second excited state (which is even, so choose the appropriate boundary conditions). Use the first-order forward Euler method with a stepsize $h = 0.01$ and find the dimensionless energy eigenvalue ϵ to at least eight significant figures. Use any programming language that you wish. Plot the wavefunction, $f(u)$ which is a proxy for $\psi(x)$.

2. Exactly solve $f'(u) + [f(u)]^2 = 0$ with boundary condition $f(0) = 1$. Show a plot of $f(u)$. What is f(10)?

3. Numerically solve $f'(u) + [f(u)]^2 = 0$ with boundary condition $f(0) = 1$ using the forward Euler method and step size $h = 0.01$. Show a plot of $f(u)$. What is f(10)?

Bonus: Solve as much of the other class' assignment as you can.