Computation Physics Problem Set 10

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1 Problem 1: Crank Nicolson Method

Screenshots of the animation are included as figures 1 - 3.
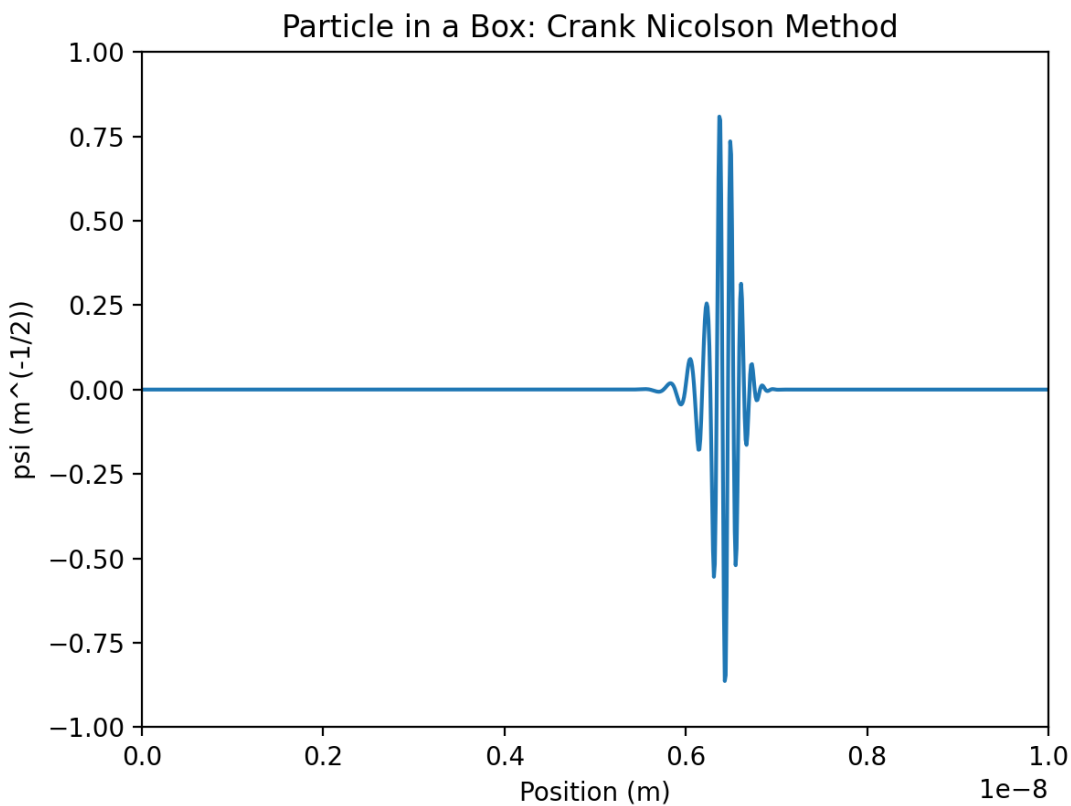

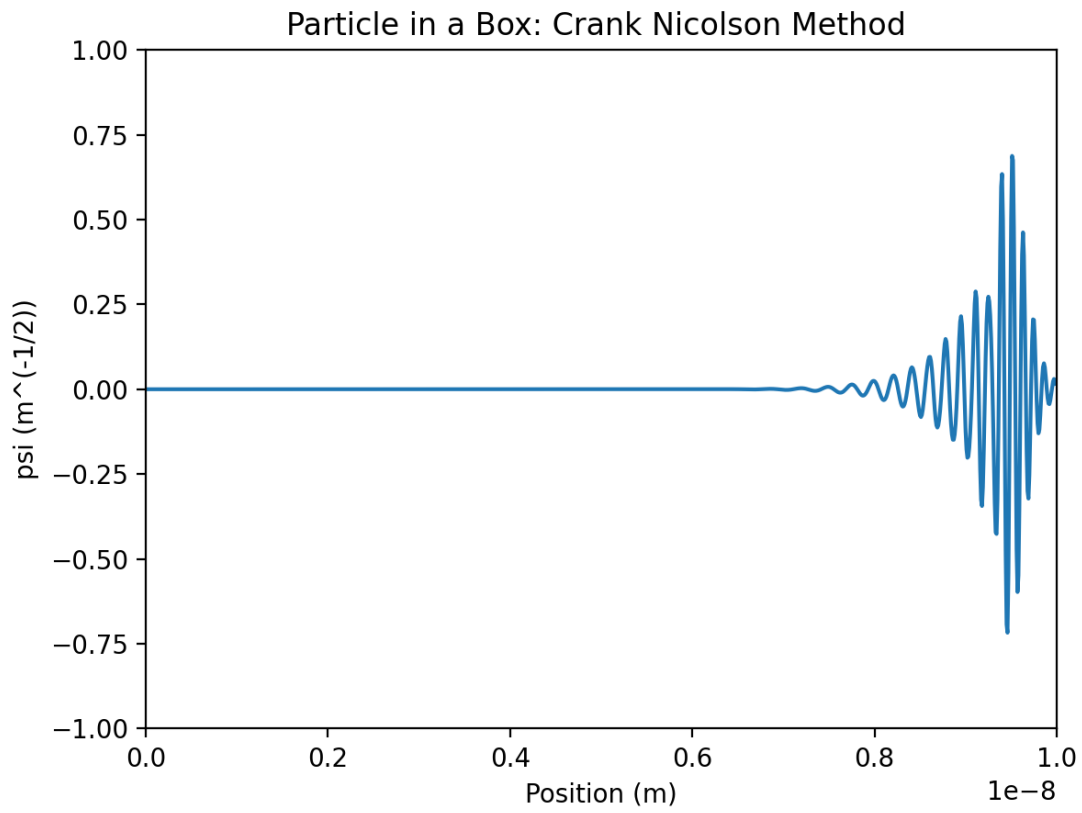Figure 1: Generated Psi function using the Crank-Nicolson Method

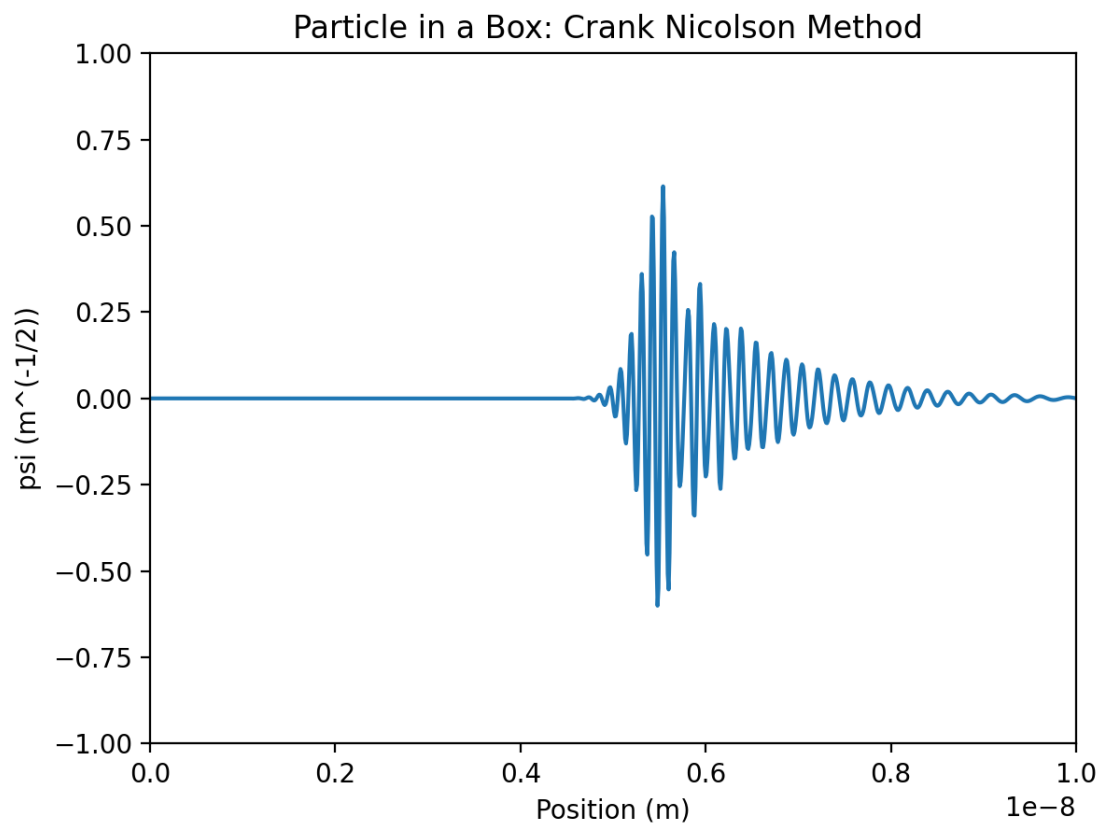Figure 2: Generated Psi function using the Crank-Nicolson Method before reflecting off the boundary condition

Figure 3: Generated Psi function using the Crank-Nicolson Method after reflecting off the boundary condition

2 Problem 2: Spectral Method

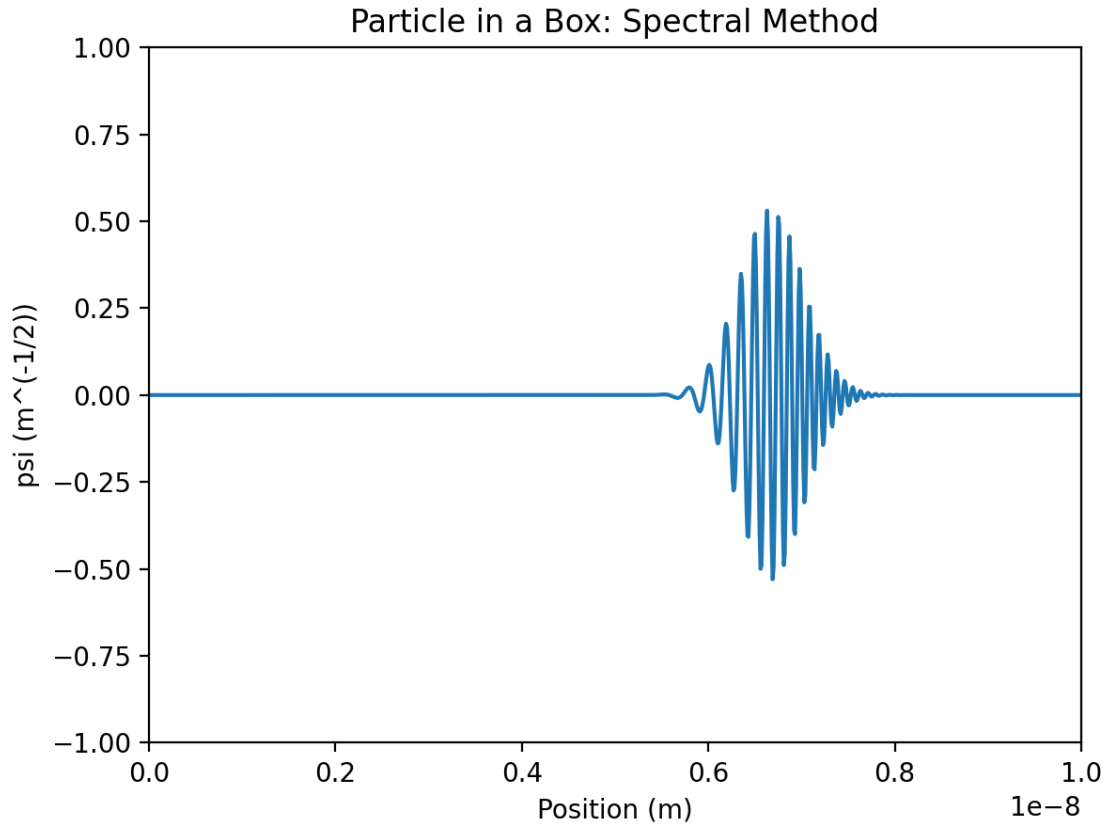Screenshots of the animation are included as figures 4 - 6.

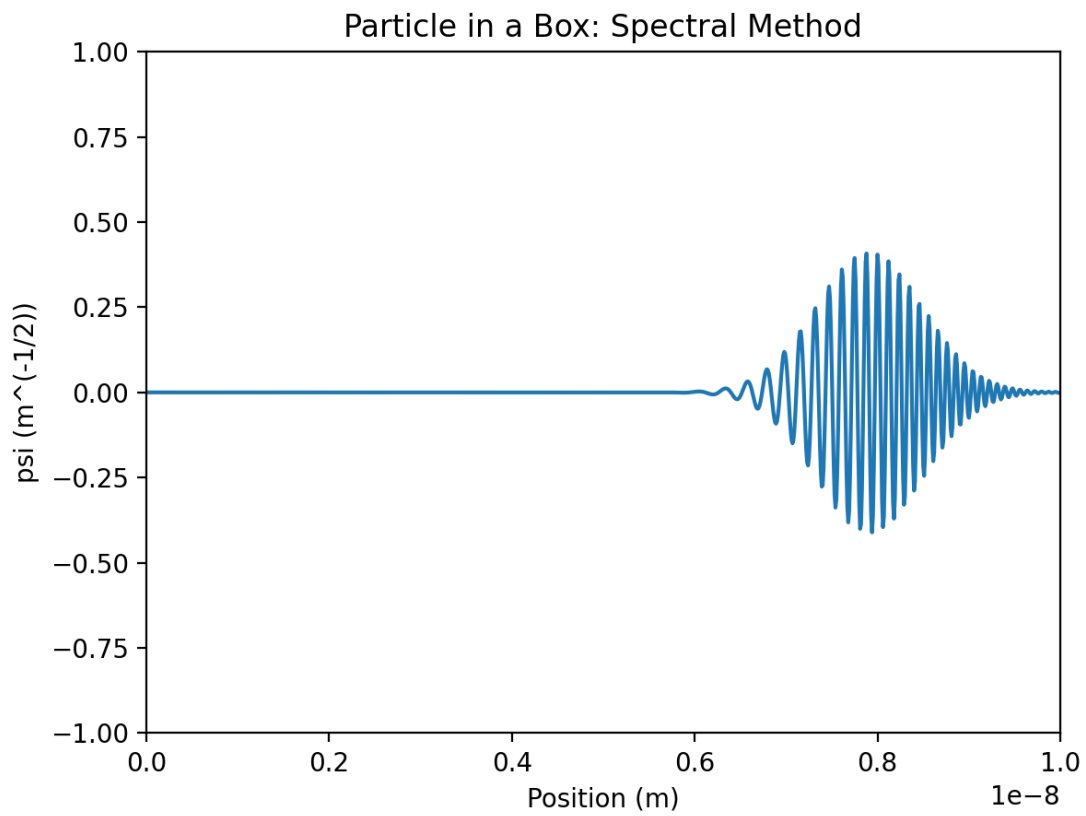Figure 4: Generated Psi function using the Spectral Method

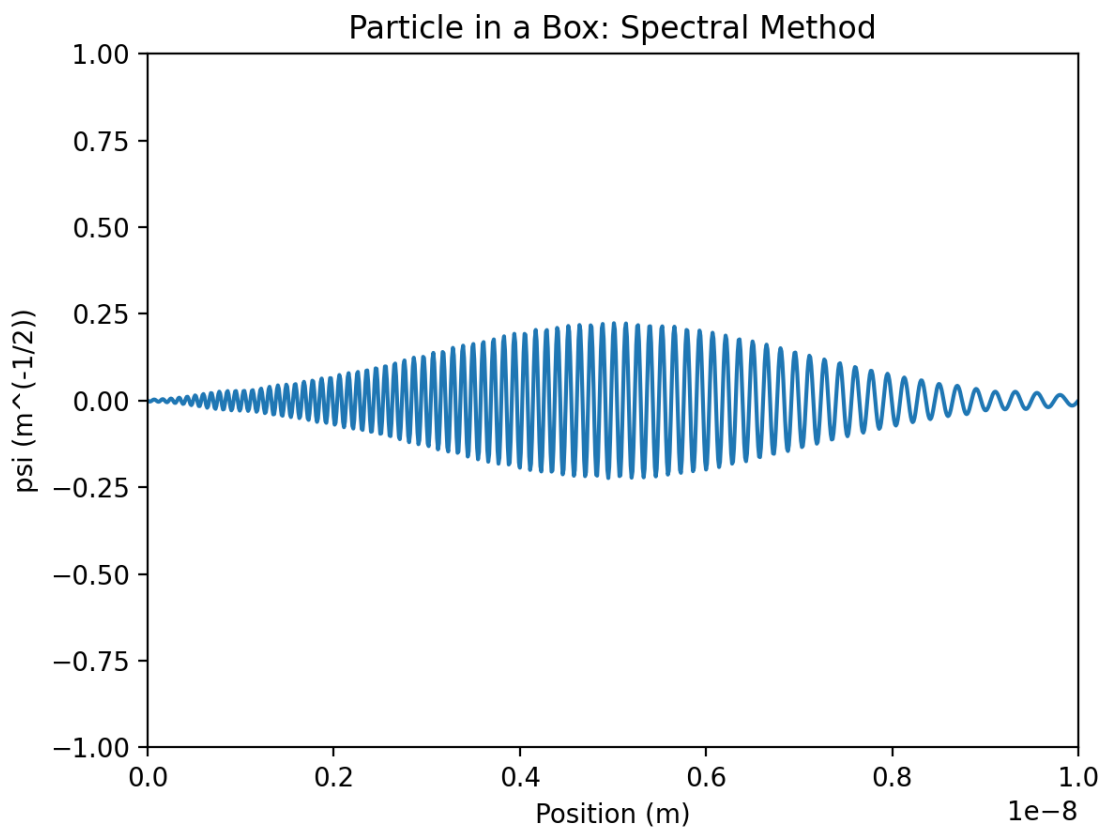Figure 5: Generated Psi function using the Spectral Method before reflecting off the boundary conditions

Figure 6: Generated Psi function using the Spectral Method after reflecting off the boundary conditions

3   Explanation of the Physics

This is for both Problem 1.c and Problem 2.d

The wave travels towards the right-hand boundary, reflecting across the boundary and returning. The parts of the wave corresponding to higher energies travel faster than the parts of the wave with lower energy, which is why the wave becomes so dispersed/spread out over time. Both versions of solving for the wave at various times show similar motions, though the spectral method is smoother and more accurate.