

Classwork 3

Write a computer program to construct a Hamiltonian of a free particle in 1D with PBC written in the discretized position basis. Consider Having N -sites in the 1D ring, so that, $(N+1)$ th site is the same as the site 1. Consider lattice spacing size: unity. Let, $N=50, 100$. The Hamiltonian size will be $N \times N$

Now Choose your favorite diagonalizer to solve the eigensystem of the above Hamiltonian. You will get N eigenvalues, and corresponding eigenvectors. Develop a program to sort the eigenvalues in ascending order.

The eigensystem for this simple problem can be solved exactly. Please find out the exact Eigenvalues, and compare them with the ones you found from numerical diagonalization.