

Computational Quantum Physics – Exercise 2

Problem 1 *Bound states in 1-D Schrödinger equation and eigenvalue problem*

Find the bound states solutions of the 1D Schrödinger equation with $E < 0$. Note that the solution exists only for discrete energy eigenvalues.

Proceed as described in lecture notes in section 3.1.3.

Take the potential zero outside the interval $[0,1]$ and inside the interval it can be taken as

$$v(x) = c(x^2 - x), 0 \leq x \leq 1, \quad (1)$$

where c is a constant. Please check the dependency of the number of bound states on the values of c .

Start with finding the ground state energy (zero node in your solution) and proceed further with 1, 2, 3... nodes.

P.S.: Check the number of zeros (nodes) in the solution. For your guessed energy, if you find more nodes in your solution than the desired number of nodes, decrease the guess-energy and vice versa.