Homework 7b

Write a computer program to solve scattering from a potential $V(x)$ in 1D by method proposed in the lecture, ie consider basis formed by linear harmonic oscillator functions

$$\phi_n(x) = N H_n\left(\frac{x}{x_0}\right) e^{-\frac{1}{2}(x/x_0)^2}$$

and expand the potential into basis:

$$\hat{V} = \sum_{m,n} |\phi_m\rangle V_{mn} \langle\phi_n|$$

where you calculate $V_{mn} = \int \phi_m(x) V(x) \phi_n(x)$ by numerical integration and cut the basis to finite number of terms $n = 0, 1, \ldots N$. Test it for particle with mass $m = 1$ and potential $V(x) = \lambda x^2 e^{-x^2}$. Calculate probability of transmission and reflection as function of energy and try to understand the results from shape of potential.