Exercise 6.9

$\hat{H} = -\frac{\hbar^2}{2M}\frac{d^2}{dx^2} + V(x)$, zero outside the well

go to 0 at $x = 0$ and $x = L$

Fourier sine series $\psi(x) = \sum_{n=1}^{\infty} \psi_n \sin\frac{\pi n x}{L}$

Define Constants & create the matrix

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Use nested for loops & if statements to see what equation will be use depending on whether $m = n$

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Calculate the eigenvalue using np. linalg. eigvalsh

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Repeat the same for c and d with 10×10 matrix & 100×100 matrix corresponding to each.

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Extract the eigenvectors corresponding to groud, first excited & second excited states

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Generate the x-values & evaluate the wavefunctions for each state.

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Plot the probability densities as a function of x in each state