algebra \rightarrow linear algebra

Generalized Eigenvalues with Differential Operators

In this problem, we will consider the generalized eigenvalue problem

$$-\partial_x^2 y = \lambda \left(1 + \mu \partial_x\right) y.$$

subject to the boundary conditions y(0) = y(1) = 0. Here λ is the generalized eigenvalue.

- (a) What are the eigenvectors $y_n(x)$?
- (b) Find the eigenvalues λ_n .
- (c) Sketch a plot of both the real and imaginary parts of these eigenvalues as a function of μ . Comment on what happens.