## 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 $\lambda$ is the generalized eigenvalue.
(a) What are the eigenvectors $y_{n}(x)$ ?
(b) Find the eigenvalues $\lambda_{n}$.
(c) Sketch a plot of both the real and imaginary parts of these eigenvalues as a function of $\mu$. Comment on what happens.

