

Exercise # 1: Consider the Sturm-Liouville problem

$$\begin{cases} y'' - 5y' = 3\lambda y, 0 < x < 2 \\ y(0) = 0, y(2) = 0 \end{cases}$$

- (1) Write the differential equation in self-adjoint form. Is the SLP regular ? if yes find the weight function and an orthogonality relation.
- (2) Find the eigenvalues and corresponding eigenfunctions.
- (3) Expand $f(x) = x^2$, $0 < x < 2$, in an eigenfunctions expansion.