Assignment 4
Mathematical Methods

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1. Find the adjoint equation of

$$x^2 \frac{d^2y}{dx^2} + (2x^3 + 1) \frac{dy}{dx} + y = 0$$

2. Check whether $x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} + 2y = 0$ is a self adjoint equation or not.

3. Show that $\left\{ \cos\left(\frac{n\pi x}{L}\right) \right\}_{n=0}^{\infty}$ is mutually orthogonal on $-L \leq x \leq L$

4. Show that $\left\{ \sin\left(\frac{n\pi x}{L}\right) \right\}_{n=1}^{\infty}$ is mutually orthogonal on $-L \leq x \leq L$

5. Find ~~eigenvalue~~ all values of $\lambda \in \mathbb{R}$ for which

$$-y''(x) = \lambda y(x), \quad y(0) = 0 = y(L)$$

has non-zero solutions.

6. Find the eigenvalues and eigenfunctions of the boundary value problem

$$y''(x) + \lambda y(x) = 0, \quad y'(0) = 0 = y'(L)$$

7. Determine all the eigenvalues and eigenfunctions of

$$y''(x) + \lambda y(x) = 0, \quad y(0) = 0, \; y(1) + y'(1) = 0$$

* * * The End * * *