

Homework 2

For each of the following boundary value problems either find the solution or else show that it has no solution

1. $y'' + y = 0$, $y(0) = 0$, $y(L) = 0$.
2. $y'' + y = x$, $y(0) = 0$, $y(\pi) = 0$.
3. $y'' + 4y = \sin x$, $y(0) = 0$, $y(\pi) = 0$.

In each of the following problems, find the eigenvalues and the eigenfunctions of the operator $y \mapsto \frac{d^2y}{dx^2}$

4. $y(0) = 0$, $y'(\pi) = 0$.
5. $y'(0) = 0$, $y'(\pi) = 0$.

Find the Fourier series of the following functions

6. $f(x) = -x$, $-L \leq x < L$, $f(x + 2L) = f(x)$.
7. $f(x) = x$ if $-\pi \leq x \leq 0$, $f(x) = 0$ if $0 < x < \pi$, and $f(x + 2\pi) = f(x)$.