

# BVP and Eigenfunction Problems

## *Overview of simple BVP and Eigenfunction Problems*

### Objectives

To better understand BVP and Eigenfunction Problems.

### Recitation Worksheet Problems: Section 7.1

1. Find all solutions of the boundary value problem  $y'' + 9y = 0$ , with boundary conditions:

(1a)  $y(0) = 2, y(\pi/2) = 1,$

(1b)  $y(0) = 2, y(\pi) = -2,$

(1c)  $y(0) = 2, y(\pi) = 2.$

2. Find any value of  $L$ ,  $y_0$ , and  $y_1$  such that the boundary value problem

$$y'' + 4y = 0, \quad y(0) = y_0, \quad y'(L) = y_1,$$

(2a) has a unique solution;

(2b) has no solution;

(2c) has infinitely many solutions.

3. Find the all the eigenvalues  $\lambda_n$  and corresponding eigenfunctions  $y_n$ , solutions of

$$-y'' = \lambda y, \quad y'(0) = 0, \quad y(4) = 0.$$