MAT 4220 Assignment 5

In Chapter 5, we will cover section 5.3 and 5.6

Exercise 5.3, 3, 5 (a), 6,8, 9, 12, 13

More: 1. (a) Consider the following eigenvalue problem

$$\begin{cases} X'' + \lambda X = 0, 0 < x < 1 \\ X(1) = X(0), X'(1) = 5X(0) + X'(0). \end{cases} \tag{0.1}$$

Show that all eigenvalues are **real**.

(b) Are there **negative eigenvalues**? If yes, find the algebraic equation for negative eigenvalues. Solve the following

2. (a) Solve

$$\begin{cases} u_t - u_{xx} = 0, 0 < x < 1, \\ u(x,0) = \phi(x), 0 < x < 1 \\ u_x(0,t) + u(0,t) = 0, u_x(1,t) + 2u(1,t) = 0 \end{cases} \tag{0.2}$$

by separation of variables.

(d) Under what conditions on $\phi(x)$, the solution to (**??**) remains bounded as $t \to +\infty$?

Exercise 5.6, 1, 2, 5, 8