

Worked Out Homework 6
MA 303 Fall 2011 (Aaron N. K. Yip)
Monday, Nov. 28, in class

1. (a) Consider the following differential equation:

$$\begin{aligned}u''(x) + \lambda u(x) &= 0; & 0 < x < \pi; \\u(0) &= 0, & u'(\pi) &= 0.\end{aligned}$$

- (b) Consider the following differential equation:

$$\begin{aligned}u''(x) + \lambda u(x) &= 0; & 0 < x < \pi; \\u'(0) &= 0, & u(\pi) &= 0.\end{aligned}$$

For both of the above problems, find all the (real-valued) λ such that there is a *non-trivial* solution $u(x)$. Find the $u(x)$ also.

Note: for the above problems, it can be shown (from more advanced technique) that the eigenvalue λ must be real number.

2. Find the Fourier series of the 2π -periodic function $f(x)$ which equals x^2 on $[-\pi, \pi]$.
3. Find the Fourier series of the 2π -periodic function $f(x)$ which equals $(x^2 - \pi^2)^2$ on $[-\pi, \pi]$.