Math 241, Fall 2015 **Renato Ghini Bettiol**

Homework Set 6

DUE: OCT 27, 2015 (IN CLASS)

1. Haberman 7.3.1 (a), (b), (c), (d)

2. Haberman 7.3.2 (a), (b)

3. Haberman 7.4.2

4. Can you hear the shape of a rectangle?

   a) Find the lengths of the sides of the rectangle $R = [0, L] \times [0, H]$ such that $\lambda = 2$ and $\lambda = 5$ are the smallest eigenvalues of the problem

   $$\begin{cases} \Delta\phi + \lambda\phi = 0 & \text{in } R \\ \phi = 0 & \text{on } \partial R. \end{cases}$$

   b) How about the rectangle $R' = [0, L'] \times [0, H']$ such that the smallest eigenvalues of the same problem above are $\lambda = \frac{13}{36}$ and $\lambda = \frac{25}{36}$?

   For more about *hearing the shape of a drum*, see:

   - Wikipedia `https://en.wikipedia.org/wiki/Hearing_the_shape_of_a_drum`;
   - Mark Kac "Can one hear the shape of a drum?" `http://www.maa.org/sites/default/files/pdf/upload_library/22/Ford/MarkKac.pdf`.