Math 319 - Differential Equations II
Pre-Reading Assignment # 14
due 10am Thu Oct 30th, via email

Note: This assignment is **much shorter** than it looks! You shouldn't need more than half an hour to do it, and it's a good exercise to test your understanding of what we've been doing so far.

Reading On Thursday we will start Chapter 11 which is about general boundary value problems. To help you situate this material within the material we have already learned, read the first paragraph of section 6.1 at http://people.uncw.edu/hermanr/mat463/ODEBook/Book/SL.pdf

Questions Answer the questions below to the best of your ability.

1. Referring to the first sentence of the reading, what are the trigonometric eigenvalue functions that arise from the BVPs we have been solving?

2. Write down the BVPs we have been solving. *Note: There is one ODE, and several different boundary conditions.*

3. There are several aspects of the BVPs we have been solving that make them fairly simple:

   (a) we have considered simple domains that are either symmetric $(-L < x < L)$ or have one end at $x = 0$

   (b) we have considered fairly simple BCs (Neumann, Dirichlet, mixed, or Robin)

   (c) when we considered non-homogeneous equations we kept the boundary conditions simple

   In general, problems may not be so straightforward. Using separation of variables, figure out what BVP would you obtain if you solved the non-homogeneous heat equation $u_t = Du_{xx} + q(x)u$ on $a < x < b$ and $t > 0$ with boundary conditions

   $$a_1 u(a, t) + a_2 u_x(a, t) = 0, \qquad b_1 u(b, t) + b_2 u_x(b, t) = 0?$$

   Note: This problem is *not* long. You should be able to do it in just a few lines. This is good practice for the midterm!