Math 4163 — Review for Exam 1

Exam 2 covers sections 2.3, 2.4, and part of 2.5 of the text. Some of the terminology from chapters 1 and section 2.2 will also be useful to know (see below for details.) The relevant assignments are Assignments 1, 2, and 3.

Besides reviewing the explanations and examples in the text, you can also try some of the homework problems from the ends of the sections that look similar to the ones I assigned, and (if they are odd-numbered) check your answers against the ones in the back. You could also look at the first test from the Spring 2012 semester (available on the website), although, since that was a different class, you can't expect the exam to be totally similar to that one.

Chapter 1. There's nothing in chapter 1 that's strictly necessary to know for the exam. However, it's a good idea to at least familiarize yourself with some of the terminology there. For example, you would want to know that an insulated end corresponds to a Neumann boundary condition. You should read the first two paragraphs of section 1.3 ("prescribed temperature" and "insulated boundary"). Section 1.4 is also kind of interesting, though you won't need to know any of it for the exam.

2.1, 2.2. For future reference, if not for this exam, you should at least glance at section 2.2 to see the meanings of the terms "linear" and "homogeneous" when applied to equations.

2.3. Heat equation with zero temperature at finite ends. We have covered this entire section in detail. You should be able to read and understand it from beginning to end. You can skip Appendix 2.3 on page 54 if you like.

I wouldn't recommend trying to memorize a bunch of formulas here. Remember, at the exam I will be handing out a copy of the table of eigenvalue or boundary-value problems from the inside front cover. It would probably be a good idea to know the general solution of the equation $\frac{d^2\phi}{dx^2} = -\lambda\phi$ in all cases (λ positive, $\lambda = 0$, or λ negative), but at this point you've probably got that memorized already without even trying.

2.4. Worked examples with the heat equation. We've covered section 2.4.1 (Heat conduction in a rod with insulated ends) completely, you should understand that section in its entirety. I haven't quite finished going through section 2.4.2 (Heat conduction in a thin insulated circular ring) in class, and I won't ask a question specifically on that on the exam, but I think you should review it a bit anyway. The more experience you have with different boundary conditions, the easier it will be to solve a problem with boundary conditions you haven't seen before.

2.5. Laplace's equation. We've gone through the material in section 2.5.1, starting from the problem stated in equations (2.5.7) to (2.5.11), all the way to the end (pages 68 to 71). We also did a couple of similar problems on Assignment 3. I went through part the solution to problem 2.5.1(a) in class, and finished the solution in a write-up which you can find on the course web page. (You can also find a complete solution to problem 2.5.1(b) on last year's web site, at

http://www2.math.ou.edu/∼ jalbert/courses/asst2_ soln_ 4163_ sp12.pdf.)

Section 2.5.2 will not be covered on the first exam.