

## Homework 3

Math 330

Solve each of the following problems. For this homework, you must type (in L<sup>A</sup>T<sub>E</sub>X) your solutions to at least *six* of these problems. Submit your work either on Moodle or in the homework mailbox by 4:00pm on **Thursday, September 26**.

1. Problem 1.5.5
2. Problem 1.5.9(a) — For this problem, you should use the circularly-symmetric heat equation from problem 1.5.5(c).
3. Problem 1.5.13 — For this problem, you should use the spherically-symmetric heat equation given in problem 1.5.12(c). (Although problem 1.5.12 is not assigned, it's good for practice with calculus in spherical coordinates.)
4. Problem 2.2.2 — For part (b), note that you can show that  $L$  is *not* a linear operator by finding a counterexample. That is, choose a function  $K_0$  that depends on  $u$ , and show that the corresponding  $L$  does *not* satisfy  $L(c_1u_1 + c_2u_2) = c_1L(u_1) + c_2L(u_2)$  for some  $c_1$ ,  $c_2$ ,  $u_1$ , and  $u_2$ .
5. Problem 2.2.4(a)
6. Problem 2.3.1(abcd)
7. Problem 2.3.2(beg) — In part (g), it might not be possible to obtain exact expressions for the eigenvalues. Just get as far as you are able.