Math 3113 - Ordinary Differential Equations
Review for Third Exam

The third exam will cover sections 3.4, 3.5, 3.6, 7.1, 7.2, 7.3, 7.5, 7.6, and 4.1 of the text. The relevant homework assignments are assignments 7, 8, 9, 10, 11.

Here is a guide to which portions of the text will be covered on the exam.

3.4 Mechanical Vibration. We covered most of this section in class, except the part about the simple pendulum, which you can skip over. You should know the basic material and terminology on page 173, 175, and 176. Example 1 is a good example. You should also be aware that when damping is present, whether the motion is overdamped or underdamped depends on whether the characteristic equation has real or complex roots (see page 178). However, I will not ask for detailed analyses or graphs of damped motion like those done in Example 2, so you do not need to know about pseudofrequencies or pseudoperiods.

3.5 Nonhomogeneous equations and undetermined coefficients. We covered all of this section except the final part about "Variation of parameters" (pages 193 to 195), which you can skip. If you haven't read Examples 1 through 10 yet, that is worth doing.

3.6 Forced oscillations and resonance. We talked a little bit about this section in class, but for the exam, it will be enough if you just review Example 1 and the assigned homework problem from this section (number 2 on page 206). Of course, if you have time, working out a similar problem is good practice — this goes for all the other assigned homework as well.

7.1 Laplace transforms and inverse transforms. This material is probably new to you, so to help it sink in, it would really repay you to take an uninterrupted block of time and read through the text, rather than just work out homework problems. In section 7.1, you should read from the beginning of the section through Example 8. You can skip the remainder of the material in the section.

7.2 Transformation of initial value problems. Read from the beginning of the section through Example 2. You can skip pages 451 through 453. Theorem 2 is sometimes useful, and Example 6 is worth reading, even if you will not have to actually use the technique in Example 6. You can skip pages 455 and 456.

7.3 Translation and partial fractions. You can review from the beginning of the section through Example 3, and skip the remainder of the section.

7.5 Periodic and piecewise continuous input functions. Read from the beginning of the section through Example 4; you can skip the remainder of the section. Also, remember that I treated this material a little differently in class — I rewrote $\mathcal{L}\{u(t-a)f(t-a)\} = e^{-as}F(s)$ as $\mathcal{L}\{u(t-a)g(t)\} = e^{-as}\mathcal{L}\{g(t+a)\}$ and did a couple of examples showing how to use the latter version of the formula — so it's worth re-reading that part of your lecture notes in particular.

7.6 Impulses and delta functions. You can start reading at equation (9) on page 486, and go from there to equation (15) on page 487. Then read Example 1 (I did a very similar example in class). Then skip to the subsection titled "Systems analysis and Duhamel's principle" on page 490, and read it from the beginning through Example 4 on page 491.

4.1 First-order systems and applications. Start at the top of page 232 and read through the end of Example 8 on page 234.