Math 3280 Chapters 9 and 10 Reading Notes. Prof. B. Peckham

Chapter 9: Phase planes (required for final, but not test 3)

We covered a small amount of Chapter 9 material in class, and Lab 9 also deals with phase planes. You should be familiar with the following terminology: autonomous system of differential equations, equilibrium point (called critical point in the text), and the related concepts of slope field / direction field / vector field. The following textbook reading might be useful:

- Sec.9.1, pp 517-520, up to but not including "Critical Point Behavior"

Chapter 10: Laplace Transforms

- Sec. 10.1: Read through Example 2. Skip the gamma function discussion through Example 3. Read theorem 1. Skip example 4. Read Examples 5,6, Inverse Transforms and Piecewise Continuous Functions through Example 8. Skip the rest of the section.
- Sec. 10.2: Read only through Example 5. We will figure out the same transforms done in examples Examples 4 and 5 later using a slightly different technique.
- Sec. 10.3: Read the whole section, but you need only skim example 5. I will not ask and questions on either Test 3 or the final that would require taking the inverse Laplace transform of P(s)/Q(s) where Q(s) has repeated quadratic factors that correspond to complex roots.
- Sec. 10.4: There is only about one page that you should know, the "Differentiation of Transforms" section through Example 3 (pp 612-613). Skim Example 5 - this is a NONconstant coefficient linear differential equation. It is interesting because the transformed equation is a first order differential equation, not a purely algebraic equation. But a first order differential equation in s is still easier to solve than the original second order differential equation in t. Read also the proof of Theorem 2 on p. 616.
- 10.5: (Material in this section will not be on test 3, but will possibly be on the final exam.) Read carefully through Example 4. Skim Theorem 2. Skip Examples 5 and 6. Read through Example 7. This Example is very similar to the Spring-Mass model you investigated in Labs 7 and 9, but with a "square" periodic forcing function instead of a periodic cosine forcing function. This type of forcing function, with lots of discontinuities, would be even more difficult to handle without the Laplace transform technique!