Assignments for Math 244 for Fall 2016 (part 2)

(assignments are due on the date listed)

for Monday, September 26

1. There is no particular assignment. You can review Chapter 2 if you do not feel comfortable with your knowledge of it or you can preview Chapter 3.

for Wednesday, September 28

1. Read Section 3.1 of the text.
2. Do problems 1, 4, 10, 11, 12, 18, 20, 21, and 25 in Section 3.1.
3. Turn in a solution for the following problem.
   Consider the IVP: $y'' + 2y' - 8y = 0, \quad y(0) = 11, \quad y'(0) = 4.$
   a) Find the function y that satisfies this IVP.
   b) Find the minimum value of the function. Give the exact value (this means no decimals, just a simplified expression, preferably without e or ln or fractions).

for Friday, September 30

1. Carefully read Section 3.2 of the text and think deeply about the ideas that are presented in this section.
2. Do problems 1, 2, 5, 9, 11, 14, 17, 22, 25, 29, 34, and 39 in Section 3.2. This is a long list of problems and they cover a range of different but related topics so be sure to look them over thoughtfully.
3. Turn in solutions to problems 17.5 and 22.5 from Section 3.2; these numbers indicate where the problems would fall if they were in the text.
   17.5: If $W(f, g)(t) = 2t\, e^{-t}$ and $f(t) = e^{-t}$, find $g(t)$.
   For this problem, it is sufficient to find one function $g(t)$, not an infinite collection of possible functions for $g(t)$.
   22.5: $y'' - 2y' - 3y = 0, \quad t_0 = 0$
   Read the appropriate heading to know what to do with this differential equation.

for Monday, October 3

1. Read Section 3.3 of the text. Pay attention to the graphs in this section as they reveal the three main types of solutions to the complex root case.
2. Do problems 8, 11, 12, 14, 15, 17, 18, 21, 23, and 24 in Section 3.3. Be certain that you can solve differential equations of this type quickly.
3. Turn in a solution for the following problem. Consider the initial value problem

$$25y'' + 10y' + 401y = 0,\ y(0) = 0,\ y'(0) = 4.$$

   Find (a) the function y that satisfies the IVP, (b) the maximum value of y for $t > 0$ (giving your answer correct to six decimal places; remember I want the y value not the t value), and (c) the minimum value for t_1 for which $|y(t)| < 0.1$ for all $t \geq t_1$ (giving this answer correct to three decimal places). You will need the help of some sort of computational device for parts (b) and (c).

for Wednesday, October 5

1. Read Section 3.4 of the text. You may be able to skip some paragraphs as there is some redundancy.
2. Do problems 1, 3, 5, 9, 11, 13, 15, 17ab, 18, 23, 29, and 31 in Section 3.4. For problems 23, 29, and 31, use the Wronskian method. Be certain that you do all of these problems, learn ways to find solutions efficiently, and think about the ideas behind the problems.
3. Turn in a solution to the following problem: Consider the initial value problem

$$16y'' + 8y' + y = 0, \quad y(0) = -12, \quad y'(0) = 11.$$

   a. Find the solution y to this IVP (use x as the independent variable). We are only interested in this solution for $x > 0$.
   b. Determine the value of x when $y = 0$.
   c. Find the maximum value of y. Give both the exact value and a decimal approximation.
   d. Find the x-coordinate of the inflection point on the graph of y.
   e. Determine to the nearest thousandth the minimum value of x_0 for which $y < 1$ for all $x > x_0$.

for Friday, October 7

1. No class this day due to the October break.

for Monday, October 10

1. Read Section 3.5 of the text. Be certain that you understand the basic idea behind solving nonhomogeneous linear differential equations and that you know how to choose your "guess."
2. Do problems 1, 4, 6, 8, 12, 13, 16, and 17 in Section 3.5. It is important that you be very patient doing these problems as an early mistake can wreak havoc with your answers.
3. Turn in a solution for the following problem: Solve the initial value problem

$$y'' + 3y' + 2y = 4t^2 - 3e^{-t}, \quad y(0) = 1, \quad y'(0) = 3,$$

   then find the largest interval (a, b) on which the solution is a decreasing function. Give the endpoints of the interval correct to the nearest thousandth; be careful with your rounding of these numbers.

for Wednesday, October 12

1. Read Section 3.6 of the text; the key ideas were presented in class.
2. Do problems 2, 6, 7, 16, and 17 in Section 3.6.
3. Turn in a solution for the following problem related to the ideas in Sections 3.5 and 3.6.
   a. Use the method of variation of parameters to find a particular solution to $y'' + y = \sec t$.
   b. Use your answer to (a) (and other ideas you have learned recently) to solve the IVP:

$$y'' + y = \sec t + 5e^{2t}, \quad y(0) = 0, \quad y'(0) = 4.$$

   c. For the function found in (b), find a value of t for which $y(t) = 12$ (give your answer correct to four decimal places).
   d. Find the largest interval (a, b) on which the solution found in (b) is defined, then determine $\lim_{t \to b^-} y(t)$.

for Friday, October 14

1. Look over Section 3.7 of the text. If you followed the in-class derivation of the differential equation for the motion of a spring, then you can skim the first three pages of the section. You may also skip the last part of the section on electric circuits. Look carefully at the graphs and learn the terminology, but do not let the places where the text becomes alphabet soup overwhelm you. Pay particular attention to Example 3.
2. Do problems 2, 3, 6, 7, 10, 13, and 24 in Section 3.7. Pay careful attention to units.
3. Turn in a solution for problem 7 from Section 3.7.
4. In addition to the problems you are doing, please take the time (about 6 minutes) to watch the video
   http://www.youtube.com/watch?v=j-zczJXSxnw
   If you are intrigued, you can find other images of this bridge collapse. The lecture on Friday will discuss how this sort of situation can appear mathematically.

for Monday, October 17

1. Read Section 3.8 of the text. You probably will need to do a good skimming job to get the gist of the various things that can happen to a spring system when there is a forcing function without becoming overwhelmed with the details.
2. Do problems 1, (5 and 7c), (6 and 8d), 9, 11, and 12 in Section 3.8.
3. Turn in a solution for problem 12 from Section 3.8.
4. You can review Chapter 3. Refer to the website for some review material. (This assignment may change depending on the nature of the upcoming test.)

for Wednesday, October 19

1. We have a test covering Chapter 3 of the text.