HOMEWORK 6

MATH 23, SPRING 2007

This homework set is due Monday May 7, 2007 at the beginning of class.

Problems from Boyce and di Prima. For each problem, please show all of your work in a coherent manner. Explain your methodology in complete sentences.

- 5.1 #1 − 3, 20, 25
- 5.2 #2, 4, 15
- 5.3 #10
- 7.1 #5, 7
- 7.2 #1, 2, 9, 13

Matlab problem: Consider the initial value problem

$$y'' + p(t)y' + q(t)y = 0, \ y(0) = 0, y'(0) = 1$$

(1) For p, q constants, we know how to solve the equation using our constant coefficient methods. Pick constants, $a_0 = 0, b_0 = 0$ for p and q and solve the equation. Plot your solution curve.

(2) Next, let $p(t) = a_0 + a_1 t$, $q(t) = b_0 + b_1 t$. Solve the equation using matlab (see linsys.m) as we did in class and plot the solution for enough values of a_1, b_1 to answer the following question: What is the effect of adding the linear term to p and q? Hint: try cases where $a_1 = 0$ but $b_1 \neq 0$ and $a_1 \neq 0, b_1 = 0$. This should make it easier to see the effects of changing p and q individually.

(3) Next, let $p(t) = a_0 + a_1 t + a_2 t^2$, $q(t) = b_0 + b_1 t + b_2 t^2$. Again, solve the equation using matlab and plot enough solution curves to answer the question: What is the effect of adding the quadratic term to p and q.

(4) Formulate a conjecture concerning the behavior of solutions if you were to add a cubic term, a quartic term, etc. Test your conjecture using matlab and summarize your results.