Weeks 5-6 **Math 0290** *Differential Equations* - RUBIN - Winter/Spring '09

IMPORTANT DATES:

- MIDTERM EXAM 1 will be held in class on **Friday, February 6th**. You will not be able to use calculators or notes on the exam.
- Homework from this handout is due **Monday, February 15th**. There is no quiz on Monday, February 8th.

TOPICS:

Section 4.3: Linear, Homogeneous Equations with Constant Coefficients, continued - We will finish this section by discussing the method of *reduction of order*. This method makes use of the Wronskian to find a second solution to a second-order ODE when one solution is already known.

homework:

1. Given the ODE $t^2y''-ty'+y=0$ with solution $y_1(t)=t$, find a second, linearly independent solution.
2. Given the ODE $x''-(t/(t-1))x'+x/(t-1)=0$ on $t>1$, with solution $x_1(t)=e^t$, find a second, linearly independent solution.

Section 4.4: Harmonic Motion - key concepts:

- harmonic motion
- damping, forcing
- frequency, period, amplitude, phase of oscillations
- underdamped, critically damped, overdamped

homework: pg. 163-4, # 12, 13 (USE amplitude $2\sqrt{2}$ NOT 2), 16, 18, 22.

Section 4.5: Inhomogeneous Equations; the Method of Undetermined Coefficients - The idea here is to look at the right hand side of an inhomogeneous second order ODE with constant coefficients and GUESS the form of the solution. The guess includes constants, which can be solved for to make sure the guessed function really does solve the ODE (i.e., to make the guess compatible with the given constants and right hand side). This approach works for trigonometric, exponential, or polynomial right hand sides (or for combinations of these).

homework: pg. 172-3, # 3, 7, 22, 24, 27.

Section 4.6: Variation of Parameters - This is an alternative approach to undetermined coefficients for finding a particular solution y_p to an inhomogeneous ODE. It requires guessing $y_p=v_1y_1+v_2y_2$, where y_1, y_2 solve the corresponding homogeneous ODE, and solving for v_1, v_2.

homework: pg. 177, # 2, 3, 10.

MATLAB, Chapter 5 - Here we actually use MATLAB to solve ODE numerically (that is, to generate approximations to solutions). **HOMEWORK**: pg. 72, # 1, 3.