Week 4 **Math 0290** *Differential Equations* - RUBIN - Winter/Spring '09

DUE DATE: The homework problems from this handout are due at the end of the quiz on **Monday, Feburary 2nd**. Please staple your MATLAB outputs together with your other homework problems. HEADS UP: Midterm 1 will be held in class on **Friday, February 6th**.

TOPICS:

Section 6.1: Euler's Method - Numerical methods can be used to approximate solutions to ODE, which is especially useful for various ODE that cannot be solved exactly. Euler's Method is one such method. Key concepts:

- time step
- Euler's method
- round-off error
- truncation error (Taylor's theorem)

homework: pg. 253, # 3, 9. For #9, solve from $t = 0$ to $t = 0.4$ for each specified h.

Section 4.1: Definitions and Examples (of Second-Order Equations) - Here, second-order ODE are introduced "officially", although we have already seen an example in Newton's law. The focus in this section is on an equation for a mass-spring system. Additional key concepts:

- the linear combination of a set of solutions to a linear equation is also a solution
- general and particular solutions, fundamental set of solutions
- Wronskian, linear (in)dependence of functions

homework: pg. 145, # 1, 2, 7, 10, 12, 17, 18.

Section 4.3: Linear, Homogeneous Equations with Constant Coefficients - key concepts:

- characteristic equation, characteristic polynomial, characteristic roots
- solutions to second order linear, homogeneous equations with constant coefficients if the characteristic roots are real and distinct; complex; or real and repeated

homework: pg. 156, # 3, 10, 14, 21, 25, 29, 34.

MATLAB, Chapter 4 - This (short) chapter is about functions in MATLAB. Most of you have experience with these. Complete exercises # 8 and 18 on pg. 57-8 to be sure you know how to use functions properly. You might also want to scan the chapter since a couple of useful built-in functions are mentioned there.