Chapter Review Sheets for
Elementary Differential Equations and Boundary Value Problems, 8e

Chapter 4: Higher Order Linear Equations

Definitions:

- n th Order Linear ODE
- Fundamental Set of Solutions, General Solution
- Homogeneous and nonhomogeneous equation
- Linear Dependence and Independence
- Characteristic Polynomial, Characteristic Equation
- Variation of parameters

Theorems:

- Theorem 4.1.1: Existence and uniqueness of solutions to higher order linear ODE's.
- Theorem 4.1.2: General solutions to higher order linear ODE's and the fundamental set of solutions

Important Skills:

- The methods for solving higher order linear differential equations are extremely similar to those in the last Chapter. There is simply n times the fun! The general solution to an n th order homogeneous linear differential equation is obtained by linearly combining n linearly independent solutions. (Equation 5, p. 220)
- The generalization of the Wronskian is given on page 221. It is used as in the last Chapter to show the linear independence of functions, and in particular homogeneous solutions.
- For the situation where there are constant coefficients, you should be able to derive the characteristic polynomial, and the characteristic equation, in this case each of n th order. Depending upon the types of roots you get to this equation, you will have solution sets containing function similar to those in the second order case. (Examples 2-4, p. 227-229)
- The general solution of the nonhomogeneous problem easily extends to the n th order case. (Equation 9, p. 225)
- Both variation of parameters, and the method of undetermined coefficients generalize to determine particular solutions in the higher dimensional situation. (Example 3, p. 234; Example 1, p. 239)

Relevant Applications:

- Double and multiple spring mass systems