Chapter Review Sheets for

Elementary Differential Equations and Boundary Value Problems, 10e

Chapter 4: Higher Order Linear Equations

Definitions:

• n^{th} Order Linear ODE

• Fundamental Set of Solutions, General Solution

• Homogeneous and Nonhomogeneous equations

• 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. (p. 222)

• Theorem 4.1.2: General solutions to higher order linear ODE's and the fundamental set of solutions (p. 223)

• Theorem 4.1.3: Relates linear independence to fundamental sets of solutions. (p. 225)

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 nth order homogeneous linear differential equation is obtained by linearly combining n linearly independent solutions. (Eq. (5), p. 222)

• The generalization of the Wronskian is given on page 223. 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 nth order. Depending upon the types of roots you get to this equation, you will have solution sets containing functions similar to those in the second order case. (Ex. 2 - 4, p. 231 - 233)

• The general solution of the nonhomogeneous problem easily extends to the nth order case. (Eq. (9), p. 229)

• Both variation of parameters, and the method of undetermined coefficients generalize to determine particular solutions in the higher dimensional situation. (Ex. 3, p. 238; Ex. 1, p. 243)