MATH 2930, Fall 2018
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Sections: 212, 217 **Name:**__________________________

Chapter 4.1-4.3 Review

Objectives: (1) Review the general theory for n^{th} order linear differential equations (2) Solve homogeneous linear equations with constant coefficients (3) Use the method of undetermined coefficients to solve linear equations with constant coefficients

Part 1: General Theory of n^{th} Order Linear Differential Equations

1. Determine the intervals where solutions of the following differential equation are sure to exist:

$$(x^2 - 4)y^{(6)} + x^2 y''' + 9y = 0.$$

2. Let the linear differential operator L be defined by

$$L[y] = a_0 y^{(n)} + a_1 y^{(n-1)} + ... + a_n y,$$

a. Find $L[t^n]$.
b. Find $L[e^{rt}]$.
c. Determine four solutions of the equation $y^{(4)} - 5y'' + 4y = 0$. Do you think the four solutions form a fundamental set of solutions? Why?

Part 2: Homogeneous Differential Equations with Constant Coefficients

In each problem below, find the general solution of the given differential equation.

1. $y^{(4)} - 4y''' + 4y'' = 0$

2. $y^{(5)} - 3y^{(4)} + 3y''' - 3y'' + 2y' = 0$

3. Show that the general solution of $y^{(4)} - y = 0$ can be written as

$$y = c_1 \cos(t) + c_2 \sin(t) + c_3 \cosh(t) + c_4 \sinh(t).$$

Part 3: The Method of Undetermined Coefficients Revisited

In each of the problems below, determine the general solution of the given differential equation.

1. $y''' - y'' - y' + y = 2e^{-t} + 3$