Study guide for exam 2, math 20d, Fall 2010

Hint: Best way to study is to go over as many problems as you can in the book. Both in my notes (L) and in Boyce-DiPrima (BD).

Correspondence is:
L 2.5 is in BD chapter 3
L chapter 3 is BD chapter 7
L chapter 7 is BD chapter 5

Here's the summary.

L 2.5: Nonhomogeneous equations. Be able to use undetermined coefficients. Be able to try the right form by looking at the complimentary solution and looking for conflicts. Be able to go through variation of parameters.

L 3.1: Systems. Be able to solve systems that can be solved one by one. Be able to convert higher order equations into first order systems

L 3.2: Matrix algebra. Be able to do algebraic operations with matrices and vectors. In particular understand matrix multiplication. Know how to compute determinant and how to understand if a matrix is invertible or not. Be able to invert 2×2 matrices. Know how to solve linear systems $A\vec{x} = \vec{b}$.

L 3.3: Know superposition, linear independence, existence and uniqueness for first order linear systems of ODEs. Know how to write such systems using matrices and vectors.

L 3.4: Eigenvalue method. Be able to compute eigenvalues and eigenvectors of a matrix. Be able to solve systems of the form $\vec{x}' = A\vec{x}$ using the eigenvalue method. Know how to handle both real and complex eigenvalues. Be able to write a general solution without the use of complex exponentials.

L 3.5: Two dimensional systems. Understand the listed behaviours and be able to classify 2×2 systems.

L 3.7: Multiple eigenvalues. Be able to handle multiple eigenvalues. Know what is algebraic multiplicity, what is geometric multiplicity, and what is the defect. Be able to solve systems with defect 1 (don't worry about higher defects).

L 3.8: Matrix exponentials. Be able to compute the matrix exponential and be able to solve systems using the matrix exponential.

L 3.9: Nonhomogeneous systems. Be able to solve nonhomogeneous systems using undetermined coefficients (do not worry about the other methods in 3.9).

L 7.1: Power series. Be able to expand an analytic function in a power series. Know how to compute the radius of convergence of a power series (and know what it means). Be able to expand a polynomial as a power series around any point. Know how to do algebra with power series. Know how to differentiate a power series.

L 7.2: Series solutions to ODEs. Know what is an ordinary point. Be able to solve a linear homogeneous ODE with power series methods at an ordinary point. Know what is a recurrence relation.