Preparing for the Second Exam

The test covers the material we've covered from chapter 11 through section 21.2 of the text. For details, look at the assigned homework from Friday 9/21 through Monday 10/22.

In particular:

- Know how to solve second-order differential equations that can be treated as first-order equations via the substitution $v = \frac{dy}{dx}$. (This will probably be part of a "reduction of order" problem.)

- Be able to find the general solution to a second-order, homogeneous differential equation using one given solution and the reduction of order method.

- Be able to solve any homogeneous linear differential equation with constant coefficients that I throw at you. Expect at least one characteristic polynomial to have repeated roots, and one to have complex roots. All of your final answers must be in terms of *real-valued* functions, even if the roots to the characteristic polynomial are complex. Most of these equations will be second order, but one or two may be of higher order.

- Be able to solve any second-order (homogeneous) Euler equation I throw at you. Again, all of your final answers will be required to be in terms of *real-valued* functions, even if the solutions to the indicial equation are complex.

- Be able to find both particular solutions and general solutions to relatively simple nonhomogeneous equations using the "method of undetermined coefficients" (aka: "method of educated guess"). I am likely to ask you to completely solve one nonhomogeneous equation, and to give me the "*first* guess" (without determining the coefficients) for each of one to four other nonhomogeneous equations.

- Be able to solve initial-value problems, both those involving homogeneous differential equations and those involving nonhomogeneous differential equations. **Expect to have to solve an initial-value problem involving a nonhomogeneous differential equation** (as in part b of exercises 1, 2, 3 and 4 of chapter 21).

- Expect some of the problem(s) to, at least in part, test you to see if you have a basic grasp of the basic theory. I want assurance that you know how to construct a general solution to a linear differential equation from an appropriate collection of particular solutions to either the given equation or, if necessary, the corresponding homogeneous equation. You should also be able to recognize when a certain set of solutions is "appropriate" or not (e.g.: knowing to ask things like "Do we have the right number of solutions?" and "What about 'linear independence'?")