Math 366 — Test 3 Review Sheet

The exam covers sections 3.1, 3.2, 4.1, 4.3, 4.5. You should be able to:

1. Solve a variety of word problems involving differential equations or initial value problems.
    - linear equations or non-linear problems
        - integrating factor
        - separable
        - use a *given* solution to apply to a specific case (like the Newton's Law of Cooling problem that was in the homework)
        - logistic growth
            * carrying capacity
            * relative growth rate
2. Theorem that states the conditions under which a unique solution exists (Thm 4.1.1).
3. Theorem that states that if y_1 and y_2 are both solutions to a linear DE, then so is a linear combination of them. (Superposition Principle, Thm 4.1.2)
4. Solve initial and boundary value problems
    - Know that solutions to the BVP may or may not exist, and may or may not be unique.
5. Be able to show that a set of functions is:
    - linearly dependent
    - linearly independent
    - a fundamental set of solutions to a homogeneous differential equation
6. Linear DE with constant coefficients
    - Solve homogeneous case (using guess of e^{mx})
        - distinct real solutions of the auxiliary equation
        - solutions to the auxiliary equation with multiplicity greater than one
        - complex solutions of the auxiliar equation
    - Find a DE with a given general solution (hint: use the auxiliary equation)
    - Use the method of undetermined coefficients (annihilators) to find a particular solution to a nonhomogeneous DE (section 4.5)
7. Vocabulary
    - homogeneous
    - non-homogeneous
    - differential operators
    - linear operators
    - linearly independent functions
    - linearly dependent functions
    - Wronskian
    - general solutions of a DE
    - complementary solution of a DE
    - particular solution of a DE
    - auxiliary equation
    - annihilator operation of a function (section 4.5)
8. Pre-calculus topics
    - $\sinh(x)$ and $\cosh(x)$
    - trigonometric identities
    - factor polynomials (rational roots theorem, synthetic division)