Math 366 — Test 2 Review Sheet

The exam covers sections 4.7a, 2.1, 2.6, 1.3, and 3.1.

You should be able to:

1. Determine some qualitative information about a solution to a differential equation without finding a solution.
   - increasing/decreasing
   - concavity
   - end behavior (limits as $x \to \pm\infty$)
   - basic sketch using that information
2. Be able to set up a differential equation for some real-life situations (section 1.3).
3. Know what analytical, qualitative, and numerical approaches to working with differential equations refer to.
4. Direction fields (section 2.1)
   - Find and draw some lineal elements
   - Given a direction field, draw by hand solution curves through a specific point.
5. For autonomous differential equations
   - Find critical points
   - Find equilibrium solutions
   - Draw a phase portrait
   - Determine if an equilibrium solutions is stable, unstable, or semi-stable (other vocabulary: an attractor, a repeller).
   - Draw solutions by hand in a phase portrait.
6. Know Euler's method, and be able to do it with your calculator.
7. Solve a variety of word problems involving differential equations or initial value problems.
   - linear equations
     - 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)
8. Recognize and solve *Cauchy-Euler* equations
   - homogeneous: Use the auxiliary equation that arises when you assume $y = x^m$