LIST OF CONCEPTS AND SKILLS FOR TEST 1

The test covers sections 1.1-1.3, 2.1-2.5, 2.7

Chapter 1

- Know how to sketch (BY HAND) a direction field for a first order ODE, and how to sketch integral curves.
- Know how to find Equilibrium (constant) Solutions of ODEs of the form $y' = f(y)$ and how to classify them as stable, unstable or semi-stable.
- Given the slope field for a differential equation, be able to read the long term behavior of the solutions for different initial conditions.
- Know how to verify by substitution that a given function is a solution of a given ODE.
- Given the general solution to an ODE, know how to use initial conditions to find the value of the constant C.
- Know how to classify differential equations by their order and linearity.
- Know how to derive differential equations that model simple applied problems.

Chapter 2

- Know how to use the method of integrating factor to integrate linear first order equations of the form $y' + p(t)\, y = q(t)$. The integrating factor is given by $\mu(t) = e^{\int p(t)\,dt}$
- Know how to solve separable equations. Whenever possible write the solution in explicit form and be able to determine the interval in which the solution is defined.
- Know the Theorems for existence and uniqueness of solutions to first-order initial value problems (Theorem 2.4.1 and Theorem 2.4.2) and how to apply them.
- Be able to solve applied problems such as “mixture” problems and problems involving Newtons's Law of Cooling.
- Know the formula for Euler's method and how to use it to derive recursive approximations for a given IVP.