1 This list is not in final form. Like, stuff may yet be added to it.

2 Test #1 is

   Friday
   9/23/05.

3 The test will cover the material of Assignments #1 – #7, roughly.

4 Review the following:

   (a) Be able to tell whether a given function is a solution of a given differential equation.

   (b) Be able to solve differential equations of form

   \[ \frac{dy}{dt} = f(t). \]

   This is just an antiderivative problem such as you met in MATH170 or 175:

   (i) \( y' = \frac{1}{1 + t^2} \)

   (ii) \( y' = e^{-4t} - \sin(3t) \) (and the initial-value problem \( y(0) = 3 \)).

   (iii) \( y' = \frac{1}{t} \) (and the initial-value problem \( y(-5) = 3 \)).

   (c) The fish with a constant growth rate and a constant harvesting rate provided our first example of a First-Order Linear Differential Equation.

      (i) Be able to solve it. Like, be able to find formulas for solutions of associated initial-value problems.

      (ii) Be conversant with the equilibrium solution.

      (iii) Know the behavior of solutions which start below the equilibrium solution – how MATH-170 considerations drive this.

      (iv) Know how solutions which start above the equilibrium solution behave.

   Analogous considerations arise when we put the “overcrowding” term into the mix. Then there were two equilibrium solutions.

   (d)

   (e) What’s an autonomous differential equation? What distinguishes the direction field of and autonomous differential equations from the direction field of a non-autonomous differential equation
(f) There just HAS to be a mixing problem.

(h) Example 1.3.3 provides a separation-of-variables example done more straightforwardly than in examples 2.5.1 and 2.5.2. Example 1.3.3 also provides an example of a non-autonomous differential equation with an equilibrium solution. See (m) below.

(i) Know the Existence and Uniqueness Theorems for solutions of initial-value problems involving

   (i) First-order linear differential equations.

   (ii) Differential equations of the form

         \[ y' = f(t, y) \]

(j) On assignment #4, several of you used the Theorem 2.2.1 formula to handle and initial-value problem involving a differential equation which has discontinuous coefficients.

(k) What’s a nullcline? What’s an isocline. Can you use these “clines” to get a rough idea of where solution curve go?

(l) The important thing about the Predator-Prey system is the methods we used to infer the behavior of solutions.

(m) Watch out for the Laws of Exponents and the Laws of Logarithms in problems such as 2.5: 5, 6, 7 from assignment #7. This will help you get the integration constant to show up in the right place in your final answer.

(n)