Math 266B **Winter 2006** **Guide for Test 3**

The third test is in class on Friday 17 February.
Here are some sample questions, so that you have an idea of what to expect.

1. Solve each differential equation.

   (a) $\dfrac{dy}{dt} = 2\cos(3t)$, where $y(0) = 7$.

   (b) $\dfrac{dy}{dx} = 2y + 1$, where $y_0 = 3$ for $x_0 = 5$.

   (c) $\dfrac{dr}{ds} = \dfrac{\sin(s)}{e^r}$, where $s_0 = 5$ for $r_0 = 7$.

2. Solve the differential equation $\dfrac{dN}{dt} = 5(N-2)(N-3)$, where $N(0) = 7$.

3. Suppose we know that $\dfrac{dN}{dt} = N(N-1)(N-3)$. (Do **not** try to solve this equation.)

   (a) Find the equilibria, and classify each equilibrium as stable or unstable.

   (b) If $N(0) = 2$ then what value will $\lim\limits_{t\to\infty} N(t)$ have? Justify your answer.

4. That one pond in your home town has become contaminated with a (soluble) polutant at concentration 3 grams/liter. The pond has volume of 50000 liters. Clean rainwater flows into the pond and the average flow rate of the stream leading out of its spillway is 4 liter/minute. How long will it take until the concentration lowers to 1 grams/liter?