Warm-up Problems - March 10, 2006

Extra Credit?
(If my signature is here write down your name turn it in for extra credit. No signature? Arrive earlier!)

1. Chris plans to make an initial deposit into an account that pays 0.05% interest, compounded continuously. He then plans to make withdrawls at a rate of $5000 per year.

   (a) Let y be the amount of money in the account.
   Let D be the amount of the intial deposit.
   Set up the differential equations.

   (b) Solve the differential equation.

   (c) If Chris wants to be able to be able to withdraw for 10 years, how much should the initial deposit be?

Lecture Problems

2. Mixture problem:

   - 1000 gallon tank
   - Water in: 10 gallons per hour. Contains 1.5 pounds of pollution per gallon.
   - Water out: 8 gallons per hour. Flows out completely mixed.
   - Initially the tank contains 500 gallons, 4 pounds of pollution per gallon.

   Let p be the amount (in pounds) of pollution in the tank at time t hours.

3. Find $p(0)$.

4. Find the volume of the tank at any time.
   (If you are having difficulty with this question, determine the volume at $t = 0$, $t = 1$, $t = 2$, $t = 3$, etc.)

5. What is the rate (in pounds per hour) that pollution is entering the tank?

6. At any given time t, what is the concentration of the pollution in the tank (pounds per gallon)?

7. What is the rate (in pounds per hour) that pollution is leaving the tank?

8. What is the differential equation for $p' = \frac{dp}{dt}$?

9. What is the general solution to the differential equation?

10. What is the initial condition and what is the particular solution to the differential equation?

11. How much pollution is in the tank after 10 hours? (in pounds)

12. What is the concentration of the pollution after 10 hours? (in pounds per gallon)

13. What is the concentration in the tank when the tank starts spilling over?