Week 7
MATH 34A
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Given that there's a midterm this coming Friday based on the material from homeworks 4-8, I decided to compile some of the harder and less done questions from these homeworks. In this packet, there is one question from each of homeworks 4-8, as well as two problems from homework 9.

Here's how today's going to work. As usual, I will devote the first half hour to letting you guys have a crack at these questions, while walking around to help. Afterwards, I will present some problems. During this half hour, you can either work on this packet as you usually would, or focus on the first five questions (ie. from HW 4-8) and treat this like a "practice midterm". The thing is though, I DO NOT CLAIM THIS WILL BE SIMILAR IN ANY WAY, SHAPE, OR FORM, TO THE ACTUAL MIDTERM. In particular, I do not have any part in writing the midterm, nor did the professor have any part in the creation/compilation of this worksheet.

4.56 On the planet Maximillian live Sprogs and Graks. Initially there were 3200 sprogs and 400 Graks. The population of Sprogs doubles every 10 years and that of Graks doubles every 5 years.

(a) How many Graks were there after 2.5 years?

(b) When are there as many Sprogs as Graks?

5.37 A tank initially contains 1000 liters of pure water. Then water containing 5 mg of detergent per liter starts to enter the tank at the rate of 30 liters per hour.

(a) How long until the average concentration of detergent in the tank is 2 mg per liter?

(b) How long until the average concentration of detergent in the tank is x mg per liter?

(c) Sketch a graph showing the function you obtained in (b). Put x on the horizontal axis and t on the vertical axis.

(d) What does your answer to part (b) give when x = 7. Do you notice anything strange? Can you explain this?

6.33 The population of a country is growing exponentially. The population in millions was 90 in 1970 and 120 in 1980.

(a) What is the population t years after 1970?

(b) How long does it take the population to double?

(c) When will the population be 400 million?

7.22 Air is pumped into a spherical balloon, so the balloon expands. The volume of a sphere of radius R is $\frac{4\pi R^3}{3}$. If the radius of the sphere after t seconds is 2t centimeters, at what rate is air being pumped in when t=5? (Hint: the rate air is pumped in equals the rate that the volume of the sphere increases).

8.19 A rectangular storage container with an open top is to have a volume of 10 m^3. The length of its base is twice the width. Material for the base costs \$9 per m^2. Material for the sides costs \$9.6 per m^2. Find the dimensions of the container which will minimize cost and the minimum cost (ie. find the base length, base width, height, and the resultant minimum cost).

9.4 Solve the following equation for w in terms of the other quantities.

$$\frac{6}{w-1} + \frac{a}{b+a} = -6$$

9.36 A baseball team plays in a stadium that holds 64000 spectators. With the ticket price at \$11 the average attendance has been 25000. When the price dropped to \$10, the average attendance rose to 32000.

(a) Find the demand function p(x), where x is the number of the spectators. (Assume p(x) is linear.)

(b) How should ticket prices be set to maximize revenue?