The Third Group Project

Due Thursday 21 November 1996

Form a group (of at least 3, preferably 4, at most 5 people) of your choice; be sure your group shares a convenient out-of-class meeting time. Each group will turn in one paper with a title page containing the name of each group member. To try to insure that everyone odes their share of the work, each name should be followed by a percentage representing the percentage of the work that the group, as a whole, felt that that person did. Thus if the people in the group are A, B, C, and D and everyone put about the same amount of work into the project, then everyone would be rated 25%. However, if person A did a lot of work and person C only only did a little bit, then the numbers might look like A 40%, B 25%, C 10% D 25%. As long as all the percentages are roughly the same, each group member will receive the same grade.

You are being given the project two weeks before it is due, which provides ample out-of-class meeting time. One good place and time for this is Fridays in our regular class room at our regular MW class time. As usual, to receive credit you must work in a logical fashion, show all your work, and clearly explain your reasoning in complete sentences.

MANDATORY: Each group must show me their mathematical progress on their project by Friday 15 November. As usual I will be in the class room on Friday and so each group should send at least one of its members to see me the morning of the 15th, if not before. Groups that do not show me some progress by the 15th will lose 5 points on the project. Note that on this preliminary version I will not penalize you for incorrect work, only for not having put enough effort into it. I will help you correct errors so it is to your advantage to have as much done as possible by the 15th.

The Project: # 8 & 9 from § 4.1 .

Hints on # 8

(1^{st}) Read through the whole problem before you start to actually solve it.

(2^{nd}) Refresh your memory by looking over the LOGISTIC EQUATION that was introduced in the text on page 74 (# 1,2,3) along with THE LOGISTIC EQUATION WORKSHEET from class on 18 September.

(3^{nd}) Do (8a) – ie. find a differential equation that describes the growth of $y = Y(t)$.

(4^{th}) Start (8c) – find a differential equation that describes the growth of $y = Y(t)$ in the setting of (8c). **In your write-up**, include this differential equation.

(5^{th}) Work through the Maple Worksheet `logistic8.ms`. It will help lots. **In your write-up**, tell me the `numberofsteps` that you used.

(6^{th}) With the help of `logistic8.ms`, do (8b) & (8c). Obtain the requested approximations off the plots provided from `logistic8.ms` – just put the mouse-arrow on the desired point on the plot, push down the left-hand mouse button, and read the coordinates off from the upper left-hand corner of the plot window (yes, these will be rough approximations).

(▷) **In your write-up**, for the requested approximations in (8b) & (8c), indicate on your graph where/how you were reading off the data AND then give a numerical approximation to the question.

Hints on # 9

(1^{st}) Read through the whole problem before you start to actually solve it.

(2^{nd}) Hint for (9a): think of units ....

$$\frac{\text{lbs. of alcohol per hour}}{\text{lbs. of yeast}} \cdot \text{lbs. of yeast} = \text{lbs. of alcohol per hour}$$
$$= \frac{\text{lbs. of alcohol}}{\text{hour}} = \Delta A\ .$$

(3^{rd}) Hint for (9b): think of units again, just like in (9a).

(4^{th}) Fermentation ends when no more alcohol is being produced, ie. when $A' = 0$. But for practical reasons, let's consider the fermentation finished when $A' \leq .001$.

(5^{th}) With the help of `logistic9.ms`, do (9c). You will have to input some Maple code here – if you need help, just ask me – so perhaps you do not want to wait until the last minute to do this problem. Obtain the requested approximations off the plots provided from `logistic9.ms` – just put the mouse-arrow on the desired point on the plot, push down the left-hand mouse button, and read the coordinates off from the upper left-hand corner of the plot window (yes, these will be rough approximations).

(▷) **In your write-up**, for the requested approximations in (9c), indicate on your graph where/how you were reading off the data AND then give a numerical approximation to the question. Also, tell me the `numberofsteps` that you used.