Homework due Monday September 16

From now on we will be using the computers, most immediately to solve and plot solutions to the S-I-R equations and to use the Maple `plot` command to find maximums and minimums of functions and solve equations. I will be in our usual class room on Wednesday night at 5:30 for an hour and on Friday morning at 9:05 for people who want help with the computer.

1. Review your solutions to problems 15, 16 and 17 on page 20 of the text. In these you computed the S, I, and R values at $t = 2$ in two ways. First by letting $\Delta t = 1$ and taking two steps. Second by letting $\Delta t = 2$ and only taking only one step.

    (a) Explain why the two answers for S, I, and R are different.

    (b) Which of the two answers do for S, I, and R do you think is closest to the true values? **Explain your answers in complete sentences.**

    (c) How would you go about getting an even better estimate for S, I, R when $t = 2$. **Again explain you answers in complete sentences.**

2. Use the Maple program `SIR.ms` to compute S, I, and R at $t = 2$

    (a) using $n = 10$ steps (which means the step size is $\Delta t = 2/10 = .2$).

    (b) using $n = 100$ steps (which means the step-size is $\Delta t = 2/100 = .02$).

    (c) Keep making n larger until you have the values of S, I and R accurate to two decimal places.

    (To get the program SIR.ms type `getclass howard SIR.ms` (and you must use the capitals). Then open maple and open the file `SIR.ms`. To do the problems above you will have to change some of the numbers in the program, but if you read the handout and the text in program I hope it is clear what has to be changed.

3. Use the Maple program `SIR.ms` to do problems 16 and 17(a) on pages 48–49 of the text and give answers that you believe are accurate to two decimal place. (Just as above you will have to keep making the value of n larger until you things stabilize to the correct number of decimal places.)

4. Use the Maple `plot` command to find the maximum of the function $\sin(x)e^{2x}$ on the interval $[0, \pi]$ accurate to three decimal places. Your answer should be in a sentence that reads like "I plotted the function $f(x) = \sin(x)2^{3x}$ on the interval _____ and found that the maximum of $f(x)$ was _____ and it occurred at the point $x =$ _____. (As a check here is a problem I did. By zooming in several times I found that the maximum of $H(t) = t2^{-t}t$ on the interval $[0, 2]$ to be .553 and this occurred at the point $t = 1.443$. I found this by zooming in until the range of t was $1.445 \le t \le 1.55$. This is accurate to at least two decimal places.)