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Term Project: *SIR* **using Sage, Due Friday, May 1**

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Your assignment is to complete the following exercises on pages 25–27, in Section 1.3, of the CiC text:

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Part 5: SIR using Euler's method and Sage (Exercises 23–28)

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IMPORTANT GUIDELINES FOR COMPLETING THIS ASSIGNMENT. Please turn in, on your own paper, neatly written, complete answers to **all** questions posed in **all** of the Exercises 23–28. For many of the exercises, you will also be required to turn in some graphs and/or some code. **Instructions on exactly what needs to be handed in, and how**, are in the "Hints and Notes" below. Please read these carefully, and follow them closely.

Hints and Notes:

1. For this assignment you'll need to download, from the link that says "The Sage Page" on our course page, the program SIR.sws. You'll then need to upload it to your own Sage account. If you've forgotten how to do this, ask someone (your instructor, LA, TA, or someone in the group with whom you're working on this mini project).

2. In various of these exercises, you will be asked to turn in some graphical output. You *need not* print in color. You certainly can if you would like, but black and white graphs are perfectly acceptable.

   The easiest way to make copies of your Sage graphs, for printing or saving to a file, is to simply take screenshots.

   However, if you want, you can also save Sage graphs to PDF files. For example, evaluating the last cell of your SIR.sws worksheet, where it says `SIRgraph.save(sirgraph.pdf')`, will save the graphical output from the previous cell as a pdf file `sirgraph.pdf`. Clicking on the output link `sirgraph.pdf` will then take you to the pdf output. WARNING: After you click on the link `sirgraph.pdf`, you should reload the web page that you're taken to. If you don't reload, the page may still show a graph from an earlier exercise.

   YOU DO NOT NEED TO TURN IN ANY CODE FOR THIS PROJECT UNTIL THE VERY END. See the last note below.

3. **Exercise 23.** Part (a): You *do not* need to turn in any graphs for this part of the exercise.

4. **Exercise 24.** Please *do* turn in a copy of the graph you get when you run the program here (after you've changed the stepsize, as described in this exercise).

5. **Exercise 25.** Please *do* turn in a copy of the graph you get when you run the program here (after you've changed the recovery coefficient b, as described in this exercise).

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6. **Exercise 26.** Please *do* turn in a copy of the graph you get when you run the program here (after you've changed the recovery coefficient *b back* to what it was, and also made whatever changes you are asked to make in part (a) of this exercise).

7. **Exercise 27.** Part (a): if you're not sure what changes you need to make to reflect the requested change (to this situation where recovered can become susceptible again), you may want to refer to the In-Class Activity from Wednesday, April 22 (under the "Week 14" notes from our course page).

   Also, for this exercise, please *do* turn in a copy of the graph you get (after you've modified the code to reflect the requested changes, and have run the new code to generate the new graph).

8. **Exercise 28.** For this exercise, please *do* turn in a copy of the graph you get (after you've modified the code to reflect the requested changes, and have run the new code to generate the new graph).

   Now, once you're done with everything, give your Sage program a name that includes your last name (for example, `SIRS_lastname.sws` – note the "SIRS" instead of "SIR," to denote the fact that this code illustrates the SIRS model), and share it with me in the usual way. That's all!