Lab 2: Introduction to Sage

Goal

The goal of this lab is to introduce you to Sage, which is a free open-source mathematics software system licensed under the GPL whose goal is to provide a viable alternative to (the very expensive!) Mathematica, Maple, Magma, and Matlab.

Directions

In groups of 2–4, follow the instructions below. I will walk you through creating a new Sage Notebook account and then you will "play" with a Sage worksheet. Each group will be required to email me a copy of their completed Sage worksheet by **5:00PM on Friday, February 16**. You do *not* need to turn in this sheet of instructions.

What is Sage?

The following is take from http://www.sagemath.org/tour.html:

> Sage is built out of nearly 100 open-source packages and features a unified interface. Sage can be used to study elementary and advanced, pure and applied mathematics. This includes a huge range of mathematics, including basic algebra, calculus, elementary to very advanced number theory, cryptography, numerical computation, commutative algebra, group theory, combinatorics, graph theory, exact linear algebra and much more. It combines various software packages and seamlessly integrates their functionality into a common experience. It is well-suited for education and research.

> The user interface is a notebook in a web browser or the command line. Using the notebook, Sage connects either locally to your own Sage installation or to a Sage server on the network. Inside the Sage notebook you can create embedded graphics, beautifully typeset mathematical expressions, add and delete input, and share your work across the network.

Why use Sage?

Sage is free!

- Downloading free
- Installing free
- Copying free
- Bug fixes free
- Future versions free
- Support is free

Sage is open-source!

- No hidden algorithms (if you are so inclined you can "lift the hood and look inside")
- Can study implementation
- Can correct, improve, contribute to Sage

Getting to know Sage

Let's start with an introductory video. Watch the first video located at

<div align="center">

http://sagemath.org/help-video.html

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Don't expect to understand everything that happens in this video. It is meant to whet your appetite.

Sign up for a free Sage account

Each member of your group should repeat the following steps.

1. Go to http://www.sagenb.org/.

2. In the box on the right, click on "Sign up for a new Sage Notebook account."

3. Follow the three steps on the screen. I suggest using the same username as your myPlymouth username. *Important:* remember your password!

4. Send me an email (dcernst@plymouth.edu) with your username. (If you want, one person can send me a single email with everyone's username from your group listed.)

Upload a Sage Worksheet

Have one person in your group log in to their Sage account; it does not matter who. When you first log in you will be on the "Home" screen. Click on "Upload," which is located towards the top left of your screen. There are several options for uploading a worksheet (which are .sws files). The middle option is to upload a file with a specified URL. In that middle entry, type in the following address *exactly* as you see it here:

<div align="center">

http://oz.plymouth.edu/~dcernst/sage/IntroductiontoSage(Calculus).sws

</div>

This should open the corresponding worksheet in Sage. I want you to do the following:

1. Work through the worksheet by clicking "evaluate" (or hitting "Shift+Enter") at the end of each Sage cell. Feel free to edit the contents of a cell to see what happens. I don't care if you break something. However, it might be a good idea to leave the cells that I've already typed things into, so that you can use them for examples. I describe how to make a new cell in the worksheet.

2. When you are done, click "Save" at the top of the worksheet.

3. Now, select "File..." at the top left. Select "Save Worksheet to file...". Give the file a name like "Lab 2 (Tom, Dick, Sally)" and save someplace on your computer and keep track of where you put it.

4. Lastly, send me the file via email (dcernst@plymouth.edu).

5. When you are done, you should click "Save & quit" in the upper righthand corner of the worksheet. This will return you to your "home" directory of your Sage Notebook account. Click "Sign out" in the upper righthand corner to exit the Sage Notebook.

Final comments

Here are few more helpful comments. First, the way to make Sage do something is to hit "Shift+Enter". Second, if the response you get is weird, it is likely that you typed something wrong or don't have all your parentheses matching. Finally, you may often find Sage waiting a bit, since it's talking to a different computer; that's what the little green bar on the left under a cell means. If that green bar stays too long (or if several of them are all there at the same time!), just press "Esc" (the escape key); this attempts to interrupt the calculation.