

**LARSON—MATH 255—HOMEWORK WORKSHEET 10**  
**Bard’s Sage Book—Newton’s Method—The Birthday Problem.**

1. Log in to CoCalc.
  - (a) Start the Chrome browser.
  - (b) Go to `https://cocalc.com`
  - (c) Login (**your VCU email address** is probably your username).
  - (d) You should see an existing Project for our class. Click on that.
  - (e) Click “New”, then “Worksheets”, then call it **h10**.
  - (f) **Annotate your work carefully and completely. The more explanation the better!**

### **The Birthday Problem**

In class we wrote code to estimate the probability that some pair of students in a class of  $n$  students have the same birthday (month & year). We just wrote a script and never defined a function. If we had defined a function we could have **visualized** what was happening as the number of students increases.

2. Define a function `birthday(n)` that returns an estimate of the probability that some pair of students in a class of  $n$  students have the same birthday (month & year). (You should copy, modify and repurpose our code from class).
3. Find `birthday(22)`.
4. Find `birthday(23)`.
5. Interpret the last two computations.
6. Now make the plot! Run:

```
scatter_plot([(n,birthday(n)) for n in [2..365]])
```

### **Bard’s Sage Book**

The following readings and related work come from Gregory Bard’s *Sage for Undergraduates* (published by Springer and also on Prof Bard’s web page). Here’s a link: <http://www.people.vcu.edu/~clarson/bard-sage-for-undergraduates-2014.pdf>

(over)

7. **Sections 5.3, 5.4, 5.4 & 5.6—Newton’s Method.** As you read through these, **run all the code** that you see **related to Newton’s Method**. Annotate appropriately. In particular I should be able to determine what section/subsection of Bard’s book your code snippets came from. Make sure that the code runs—or get help.

If you are cutting and pasting you will discover that you have to re-type all the apostrophes, and put the code back on appropriate lines. Fix it up.

**Important Note:** When Prof Bard’s book was written `print` commands like the following worked:

```
print "Hello World!"
```

This (Python-2 style) `print` syntax is no longer supported in Version 9.x of Sage. The (Python-3 style) `print` command requires parentheses:

```
print("Hello World!")
```

8. Change all of Bard’s `print` commands to Python-3 style as you work through this text.

### Getting your homework recorded

When you are done writing up your nicely annotated code examples...

- (a) Click the “Make pdf” (Adobe symbol) icon and make a pdf of this worksheet. (If Cocalc hangs, click the printer icon, then “Open”, then print or make a pdf using your browser).
- (b) Send me an email with an informative header like “Math 255—h10 worksheet attached” (so that it will be properly recorded).
- (c) Remember to attach your homework worksheet!