LARSON—MATH 255–CLASSROOM WORKSHEET 28
Files and Data.

1. (a) Start the Chrome browser.
   (b) Go to `http://cocalc.com`
   (c) Login using **your VCU email address** .
   (d) Click on our class Project.
   (e) Click "New", then "Worksheets", then call it **c28**.
   (f) For each problem number, label it in the Sage cell where the work is. So for Problem 2, the first line of the cell should be `#Problem 2`.

Files & Data Challenge

Reading in, and working with, data files is an important ability. Last class we created a data file (`one_hundred_numbers.txt`), learned how to read it in line-by-line, and work with the data. An important thing to know/note is that a file is actually a big *string*. You can read the lines of a file with `readline()`. Those lines are also strings (and not numbers - despite how they look). If you want numbers they must be converted to numbers.

2. Here's **a multi-step problem that builds on what we did last class**. Create a new file `two_hundred_numbers.txt` that consists of each line from `one_hundred_numbers.txt` written twice. (If you don't have `one_hundred_numbers.txt` In put a copy in your CoCalc Project Handouts folder.

Interacts

Here's one more example of a CoCalc INTERACT.

3. Try to figure out what the following Sage Interact will do. Then type it in and try it.

```
x0  = 0
f   = sin(x)*e^(-x)
p   = plot(f,-1,5)
dot = point((x0,f(x=x0)),pointsize=80,color="red")
@interact
def i_taylor(order=(5,(1..12))):
  ft = f.taylor(x,x0,order)
  print("The function is {}".format(f))
  print("The order-{} Taylor series at x={} is {}".format(order,x0,ft))
  pt = plot(ft,-1, 5, color="green")
  show(dot + p + pt, ymin = -.5, ymax = 1)
```

Problems

4. (**Euclid**) Let $p_1, p_2, \ldots, p_k$ be a list of any k primes. The product p of these primes plus one is

$$p = p_1 \cdot p_2 \cdot \ldots p_k + 1$$

p is either a prime (different from each of these k primes) or it has a prime factor q also different from each of $p_1, p_2, \ldots, p_k$ (If p is prime then q is just p). This is the main idea in Euclid's proof that there are infinitely many primes. Write a program to find this prime number q given any list, $p_1, p_2, \ldots, p_k$, of primes.

5. The Fibonacci sequence F_n is defined as follows $F_0 = 0$, $F_1 = 1$ and $F_n = F_{n-1} + F_{n-2}$ for $n > 1$. What is the first term in the Fibonacci sequence to contain 1000 digits?

6. $n!$ means $n \times (n-1) \times \ldots \times 3 \times 2 \times 1$. For example, $10! = 10 \times 9 \times \ldots \times 3 \times 2 \times 1 = 3628800$, and the sum of the digits in the number 10! is $3 + 6 + 2 + 8 + 8 + 0 + 0 = 27$. Find the sum of the digits in the number 100! (100-factorial).

Getting your classwork recorded

When you are done, before you leave class...

(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 - c28 worksheet attached" (so that it will be properly recorded).

(c) Remember to attach today's classroom worksheet!