LARSON—MATH 255–CLASSROOM WORKSHEET 22
More Files—Interacts

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 **c22**.
   (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

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 one more **a multi-step problem that builds on what we did the last three classes**. We'll create a new file `one_hundred_numbers_reversed.txt` that consists of each line from `one_hundred_numbers.txt` written in backwards order.

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. The sum of the reciprocals of the positive integers

$$\sum_{n=1}^{\infty} \frac{1}{n}$$

diverges (that is, the sum goes to infinity).

(a) Find the smallest integer m so that $\sum_{n=1}^{m} \frac{1}{n}$ is at least 2.

(b) Find the smallest integer m so that $\sum_{n=1}^{m} \frac{1}{n}$ is at least 3.

(c) Find the smallest integer m so that $\sum_{n=1}^{m} \frac{1}{n}$ is at least 4.

5. 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 also different from each of these. (This implies there are infinitely many primes). Write a program to find the smallest prime number q no more than p and different from each of $p_1, p_2, \ldots, p_k$.

6. 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?

7. Find the sum of the even Fibonacci numbers less than four million.

8. By listing the first six prime numbers: 2, 3, 5, 7, 11, and 13, we can see that the 6th prime is 13. What is the 10,001st prime number?

9. $n!$ 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—c22 worksheet attached" (so that it will be properly recorded).

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