Last name _____

First name _____

LARSON—MATH 353–CLASSROOM WORKSHEET 05
Getting Started with CoCalc/Sage.

1. Sign in to your CoCalc account.
   (a) Start the Chrome browser.
   (b) Go to `https://cocalc.com`
   (c) "Create new account" using **your VCU email address** .
   (d) You should see an existing Project for our class. Click on that.
   (e) Make sure you are in your Home directory (if you put files in the Handouts directory they could be overwritten.)
   (f) Click "New", then "Jupyter Notebook", then call it **353-c05**.
   (g) Make sure you have SAGE as the *kernel*.

Number Theory in Sage

2. What operator will give you the *remainder* of a divided by b?

3. What operator will give you the *quotient* of a divided by b?

   The following examples are all from our text. We'll see today that we can compute them in Sage/CoCalc.

4. What does `prime_pi` do?

5. Code and run: `plot(prime_pi, 1,1000, rgbcolor=(0,0,1))`.

6. Find the first few Euclidean primes. Let $P_1 = 2$. Then at each step find the product of the existing primes plus 1. Add the largest prime factor that is not in your current list of Euclidean primes.

7. Assuming unique factorization into primes (the Fundamental Theorem of Arithmetic), how does this construction give a proof that there are infinitely many primes?

8. (**Density of the Primes**). Find the ratio of the number of primes in the interval $[10^i]$ to 10^i for $i = 1 \ldots 9$.

9. What is the **Prime Number Theorem**?

10. Make a combined plot of the prime counting function and the ratio in the Prime Number Theorem.

Getting your classwork recorded

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

(a) Click the "Print" menu choice (under "File") and make a pdf of this worksheet (html is OK too).

(b) Send me an email (`clarson@vcu.edu`) with an informative header like "Math 353 - c05 worksheet attached" (so that it will be properly recorded).

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