LARSON—MATH 255–HOMEWORK WORKSHEET 12
Problems.

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 "Sage Worksheet", then call it **h12**.

Annotate your work carefully and completely. The more explanation the better!. If you are stuck, get help, talk to your classmates, try things. At worst, your worksheet should include all your dead ends and **attempts**. (You can't ever succeed unless you **try**).

Return to the Collatz Conjecture. We discussed and wrote code for the Collatz

Conjecture (AKA the $3n + 1$ problem, AKA the $3x + 1$ problem) is previous classes (and so there is also code from class in your CoCalc project handouts folder).

The following iterative sequence is defined for the set of positive integers (in words, if the number is even, divide by 2 and if it is off multiply by 3 and add 1):

n $\rightarrow$ n/2 (n is even) n $\rightarrow$ 3n + 1 (n is odd)

Using the rule above and starting with 13, we generate the following sequence:

$13 \rightarrow 40 \rightarrow 20 \rightarrow 10 \rightarrow 5 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$

It can be seen that this sequence (starting at 13 and finishing at 1) contains 10 terms. Although it has not been proved yet (unsolved for 90 years!), it is thought that all starting numbers finish at 1.

Problem. Which starting number, under one million, produces the longest chain?

NOTE: Once the chain starts the terms are allowed to go above one million (and will, for starting number $999,999$, for instance).

Getting your homework recorded

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

(a) Click the Printer-icon button and make a pdf of this worksheet. (If Cocalc hangs, click the *File* button, then Save-and-Download as pdf

(b) Send me an email with an informative header like "Math 255—h12 worksheet attached" (so that it will be properly recorded).