Assignment 3

Math 383L Fall 2021

Due 9/13 (Before Class)

1 Matlab: My First Loops

Using the various tools we learned today in class, in particular a "for loop", "a while loop" and an "if then statement", demonstrate your knowledge of some of these features by completing the tasks below in a single matlab script (with comments and sections):

- (a) Write a function that calculates the nth number of the fibonacci sequence (Hint: use a for loop): $y_{n+2} = y_{n+1} + y_n, y_1 = 1, y_2 = 1$
- (b) Show that the ratio $L_n = \frac{y_{n+1}}{y_n}$ converges. To show this, produce a code that for any user given tolerance (difference between consecutive L_n terms) the code will run until that tolerance is satisfied (Hint: use a while loop).

2 Collatz Conjecture

The Collatz Conjecture is a very famous, although unproved, statement in mathematics (Wiki) that following a specific algorithm will always circle back to 1. For this last problem, you will be seeing it at work!

(a) Produce a function that starting with a user provided seed integer $n \ge 1$, does the following:

$$f(n) = \begin{cases} \frac{n}{2} & \text{if } n \equiv 0 \pmod{2} \\ 3n+1 & \text{if } n \equiv 1 \pmod{2}. \end{cases}$$

(b) Demonstrate the conjecture by using it on 1000 random integers between 1 and 1 million (Hint: modify your code to except vectors/arrays).