AM 147: Computational Methods and Applications: Winter 2023

Homework #4

Instructor: Abhishek Halder

Due: February 08, 2023

NOTE: Please submit your Homework as a single zip file named `YourlastnameYourfirstnameHW4.zip` via CANVAS. For example, `HalderAbhishekHW4.zip`. Please strictly follow the capital and small letters in the filename of the zip file you submit. You may not receive full credit if you do not follow the file-naming conventions. Your zip file should contain all .m files (MATLAB scripts) for the questions below.

Your zip file must be uploaded to CANVAS by 11:59 PM Pacific Time on the due date. The uploads in CANVAS are time-stamped, so please don't wait till last moment. Late homework will not be accepted.

Problem 1

Fixed point recursion **(50 points)**

Write a MATLAB code with filename `YourlastnameYourfirstnameHW4.m` that solves the Kepler's equation (Lec. 9, p. 10)

$$x = \underbrace{m + \varepsilon \, \sin(x)}_{g(x)}, \quad m = \varepsilon = 0.5,$$

using a fixed point recursion (Lec. 9, p. 4) of the form

$$x_{k+1} = g(x_k),$$

where k is the recursion/iteration index. We want to perform 20 recursions to obtain $x_1, x_2, \ldots, x_{20}$ for any given initial guess x_0.

In the same `YourlastnamYourfirstnameHW3.m` file, use your code to generate a figure plotting the recursion index k (in the horizontal axis) versus x_k (in the vertical axis) for 50 randomly chosen initial guesses in the interval $[0, 1]$. For generating random initial guesses in $[0, 1]$, you can look up the command `rand` in MATLAB documentation.