MATLAB: Assignment 2

Due on Friday, February 15 in class

Problem 1

In this exercise, you will code Newton's method in MATLAB.

Goal: Write a MATLAB script to approximate the cube root $\sqrt[3]{a}$ of a given number a with accuracy roughly within 10^{-8}. Use initial guess $x_0 = \dfrac{a}{2}$ and maximum 100 iterations.

Instructions

- Use $f(x) = x^3 - a$, where $a = 2 + \alpha$, and α is the **last digit** of your NAU user name.
- For $f'(x)$, define the anonymous function `fprime`
- Please rewrite the code in page 2 and play with it. Here, I have implemented the Fixed-Point iteration method for $\cos(x) - \sin(x) = 0$.
- Then start to modify my code.
- Explain steps by commenting on them.
- What are the conditions in the `while loop`? Insert your comments.
- Once you have completed the problem, generate a pdf file with the results using the **Publish** option in matlab. **Please give me a hard copy of the pdf file.**
- Do not just copy and paste the code; it will not improve your MATLAB skills, and most importantly you will get an error.
- **Failure to follow these instructions will result in loss points (up to the full amount of the homework total).**

```
clc; close all; clear all;
format long

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%% Fixed parameters %%%%%%%%%

iter = 0;
iter_max = 100;
rel_error = 10;
tolerance = 10^-8;

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

xold = 0; % initial guess

f = @(x) (x + cos(x)-sin(x)); % solves cos(x) = sin(x)

x_appro =[];
rel_error_col = [];

while ((rel_error > tolerance) || (iter > iter_max)) % ????
    xnew = f(xold); % think about this line
    rel_error = abs(xnew-xold);
    rel_error_col = [rel_error_col;rel_error];
    x_appro = [x_appro; xnew];
    xold = xnew;
    iter = iter +1;
end

tot_iter = (1:iter)';
x_appro;

fprintf('Simulation Summary \n');
fprintf('iteration  x-values  Relative error\n ')
fprintf('%3.0f \t %6.8f  \t %6.8f\n', [tot_iter' ;x_appro'; rel_error_col'])
```