Assignment 1 - Part 1

Objective:

The aim of this assignment is to compare and analyze the behavior of numerical methods studied in class {Bisection, False-position, Fixed point, Newton-Raphson, Secant}.

Description:

You are required to implement a root finder program which takes as an input the equation, the technique to use and its required parameters (e.g. interval for the bisection method).

Specification:

The program must contain the following features:

- An interactive GUI that enables the user to enter equations containing different functions such as: {poly, exp, cos, sin}. Reading from files must be available as well.
- Differentiation and Parsing is your task.
- A way to choose a method to solve the given equation.
- A way to enter the precision and the max number of iterations otherwise default values are used,
    Default Max Iterations = 50, Default Epsilon = 0.00001;
- The answer for the chosen method indicating the number of iterations, execution time, all iterations, approximate root, and precision.
- Compute the theoretical bound of the error for the methods.

The final report should contain:
- Flowchart or pseudo-code for each method.
- Data structure used and how helpful was your choice.
- Analysis for the behavior of different examples using the analysis template, and your conclusion about the behavior of each method (at least three examples).
- Problematic functions and the reason for their misbehavior and your suggestions (if exists).
- Sample runs and snapshots from your GUI.

Bonus:
- Single step mode simulation showing the iterations on the drawn function for one method of choice.

Good Luck

Assignment 1 - Part 2

Objective:

The aim of this assignment is to compare and analyze the behavior of numerical methods studied in class {Gaussian-elimination, LU decomposition, and Gaussian- Jordan}.

Description:

You are required to implement a program for solving systems of linear equations which takes as an input the equations, the technique to use and its required parameters.

Specification:

The program must contain the following features:

- An interactive GUI that enables the user to enter set of linear equations. Reading from files must be available as well.
- A way to choose a method to solve the given set of linear equations.
- A way to enter the needed parameters if any;
- The answer for the chosen method indicating the execution time, solution, precision, and the iterations (if applicable).

The final report should contain:
- Flowchart or pseudo-code for each method.
- Data structure used and how helpful was your choice.
- Analysis for the behavior of different examples using the analysis template, and your conclusion about the behavior of each method (at least three examples).
- Problematic functions and the reason for their misbehavior and your suggestions (if exists).
- Sample runs and snapshots from your GUI.

Notes:
- The assignment should be developed using Matlab.
- You should work in groups of 5.
- Copies (from your colleagues or from the internet without proper reference) will be penalized.

Good Luck