Numerical Analysis Homework: Solving $\exp(x) + x - 2 = 0$

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Objective

Use three numerical methods—bisection, the false position method, and fixed-point iteration—to find the root of the equation $\exp(x) + x - 2 = 0$.

Tasks

1. **Bisection Method:** Implement the bisection method to find the root. Provide a brief explanation of the method, including its convergence criteria. Choose appropriate initial bounds and justify your choice.

2. **False Position Method (Regula Falsi):** Implement the false position method. Explain the method and how it differs from the bisection method. Choose suitable initial points and explain your choice.

3. **Fixed-Point Iteration:** Implement a fixed-point iteration method. You must choose an appropriate rearrangement of the equation $x = g(x)$ and justify your choice. Discuss the convergence properties of your chosen iteration function.

For each method, present the following:

- A clear description of the method.

- The implementation steps in actual code.

- A discussion of your choice of parameters (e.g., initial guesses, bounds).

- A table or plot showing the convergence of the method towards the root.

- The estimated root to at least six significant figures.

Report Requirements

Introduction: Briefly introduce the problem and the methods used.

Methodology: Describe each method, your implementation, and your choices in detail.

Results: Present your results with appropriate tables, graphs, or plots.

Discussion: Compare the methods in terms of speed of convergence, number of iterations, and ease of implementation.

Conclusion: Summarize your findings and provide insights or recommendations for solving such equations.

Grading Criteria

1. **Clarity and Correctness (30%):** Clear presentation of methods, results, and discussions. Correct mathematical and algorithmic implementation.

2. **Analysis and Understanding (30%):** Depth of understanding of the methods and their convergence properties. Insightful comparison and discussion of the methods.

3. **Results and Accuracy (20%):** Accuracy of the solutions and the proper demonstration of convergence.

4. **Presentation and Organization (10%):** Overall organization, structure, and clarity of the report.

5. **Creativity and Extra Effort (10%):** Any additional analyses, visualizations, or insights that enhance the understanding of the problem and methods.

Deadline

[26-11-2023]