Theoretical Models for Computing

Lab #3

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Lab. Procedure

Activity 1: Gaussian Elimination

Objective: Implement Gaussian Elimination to solve a system of linear equations.

Task: Write a program to solve the following system using Gaussian Elimination:

```
3x+y−2z=1

2x−2y+4z=−2

−x+12y−z=0
```

Activity 2: Iterative Methods (Jacobi and Gauss-Seidel)

Objective: Implement Jacobi and Gauss-Seidel methods to solve linear systems.

Task: Solve the system of linear equations using both Jacobi and Gauss-Seidel methods.

Activity 3: Comparative Analysis

Objective: Compare the efficiency and accuracy of the methods: Gaussian Elimination, Jacobi, and Gauss-Seidel.

Task:

Solve the same system using all three methods.

Measure the number of iterations and computational time.

Compare results and discuss the advantages and disadvantages of each method.

Activity 4: Exercise

Solve the system Ax=b where

$$A = \begin{bmatrix} 5 & -2 & 3 \\ 2 & 5 & -1 \\ 1 & 3 & 5 \end{bmatrix} \text{ and } b = \begin{bmatrix} 10 \\ 4 \\ 8 \end{bmatrix}$$

using the Jacobi and Gauss-Seidel methods.

Compare the number of iterations needed to achieve a solution with an accuracy of 10^{-6}.