

Name: _____

Date: _____

Collaborators: _____

(Collaborators submit their individually written assignments together)

Question:	1	2	3	4	Total
Points:	30	20	10	10	70
Score:					

Instructor/grader comments:

Jacobi and Gauss-Seidel iterations

1. Use the code that we develop in class and conduct numerical experiments to determine the properties of the Jacobi method.

- (a) (15 points) Verify whether or not the convergence rate of the method significantly depends on the right hand side of the equation $Ax = b$ where $A = \text{ddbucky}()$. Conduct your calculations for the following vectors b_i :

1. $b_1 = \text{rand}(n, 1);$
2. $b_2 = \text{randn}(n, 1);$
3. $b_3 = \text{ones}(n, 1);$

where n is the dimension of the matrix A .

On the same graph plot the convergence parameter vs the iteration number for all calculations. Clearly describe your conclusions in your project's readme file. Place the code you wrote for this part of the homework in the matlab file **hw01p1a.m**

- (b) (15 points) Verify whether or not the convergence rate of the method depends on the matrix in the equation $Ax = b$, where $b_3 = \text{ones}(n, 1);$. Conduct your calculations for the following matrices A_i :

1. $A_1 = A;$
2. $A_2 = A + 5*\text{speye}(n);$
3. $A_3 = A + 9*\text{speye}(n);$

where $A = \text{ddbucky}()$ and n is the dimension of the matrix A .

On the same graph plot the convergence parameter vs the iteration number for all calculations. Clearly describe your conclusions in your project's readme file. Place the code you wrote for this part of the homework in the matlab file **hw01p1b.m**

2. Use the code that we develop in class and conduct numerical experiments to determine the properties of the Gauss-Seidel method.

- (a) (10 points) Reproduce your numerical experiments from Problem 1.a, now for the Gauss-Seidel method. Describe your conclusions in the readme file. Place your code in the matlab file **hw01p2a.m**.

- (b) (10 points) Reproduce your numerical experiments from Problem 1.b, now for the Gauss-Seidel method. Describe your conclusions in the readme file. Place your code in the matlab file **hw01p1b.m**.

3. Compare the numerical performance of the Jacobi and the Gauss-Seidel methods.
 - (a) (10 points) On the same graph plot the convergence parameter vs the iteration for both methods, using $A = \text{laplace2d}(n)$ and $b = \text{ones}(n^2, 1)$ for $n = 8$. Clearly describe your conclusions in your project's readme file. Place the code you wrote for this part of the homework in the matlab file **hw01p3.m**

Gitlab

4. (10 points) Create a gitlab project called **hw02** (name it exactly as shown). Upload **all** files that are required to run your matlab code and create your README.md file. Share the project with the instructor and the grader.