



General Rules

- Due date is 25 November 2002, Monday and **not subject to postpone**.
- Late submission is **not** allowed.
- There is **no** teaming up. The homework has to be done/turned in individually.
- In case of cheating, all parts involved (source(s) and receiver(s)) get zero.
- You will submit your homework electronically and also you are supposed to return a hard copy of your programs to our office (A-401). To submit your homework electronically you will use `submit371` command through a tar archive file (`hw2.tar`). This file will contain your program source codes
- In your program codes, you are required to write comments that describe your code.

Homework

1. Write a function to implement Jacobi Iteration Method to solve the linear equation $AX=B$.

The function prototype is as follows:

```
function[X, norm_2, norm_inf] = jacobi(A, B)
where  A          the matrix A
       B          the vector B
       X          solution vector X
       norm_2     vector of 2-norm distance throughout each iteration
       norm_inf   vector of infinity norm distance throughout each iteration
```

- Take initial guess as 0-vector.
- Use convergence criteria as 2-norm distance less than 10^{-6} .

2. Write a function to implement SOR (Successive Over Relaxation) Method to solve the linear equation $AX=B$.

The function prototype is as follows:

```
function[X, ite] = sor(A, B, omega)
where  A          the matrix A
       B          the vector B
       omega      relaxation parameter omega
       X          Solution vector
       ite        # of iterations
```

- Take initial guess as 0-vector.
- Use convergence criteria as 2-norm distance less than 10^{-6} .

3. Solve the following linear system

$$3x_1 - x_2 - x_4 = -3$$

$$-x_1 + 3x_2 - x_3 = 2$$

$$-x_2 + 4x_3 - x_4 = 6$$

$$-x_1 - x_3 + 4x_4 = 12$$

- a. Using Jacobi Iteration method
 - b. Using SOR method
4. Obtain the following graphs for Jacobi Iteration method for the linear system given in Part 3.
- a. Iteration vs. 2-norm distances
 - b. Iteration vs. infinity norm distances
5. To find the optimal value for relaxation parameter ω for the linear system given in Part 3, form a table for different values of ω (like the table 3.4 at page 189 in your text book). The table should contain the following columns:
- value of ω
 - number of iterations required for convergence
 - converged value
6. Prepare a report for this homework containing the following sections:
- Source code of Jacobi Iteration method.
 - The graphs obtained in Part 4.
 - Source code of SOR method.
 - The table and optimal ω value obtained in Part 5.
 - Comparison of methods.

We expect you to obey this section sequence in your reports.