Homework 3 :: MATH 504 :: Due Thursday, September 29th, 11:59 pm

Your homework submission must be a single pdf called "LASTNAME-hw1.pdf" with your solutions to all theory problem to receive full credit. All answers must be typed in Latex.

Let

$$A = \begin{bmatrix} 3 & -1 & 1 \\ 0 & 2 & 1 \\ -1 & 1 & 4 \end{bmatrix} \qquad \text{and} \qquad b = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$$

a) Use the LU factorization to express $A = LU$ where L is a lower triangular and U is an upper triangular matrices.

b) Obtain the solution x^* of the system $Ax = b$ using LU factorization of A together with forward and backward substitution.

c) Use Jacobi method twice, starting with $x^{(0)} = [1, 1, 0]^T$ to find an approximate to the solution. Report the error $\|x^{(k)} - x^*\|_\infty$, $k = 1, 2$.

d) Write a code for the Gauss-Seidel method, and apply it to find the solution of the system $Ax = b$ with 10^{-5} digits of accuracy. That is $\|x^k - x^*\| \leq 10^{-5}$ where x^* is the solution of the system $x^* = A^{-1}b$ and x^k is the kth iterate of Gauss-Seidel.