Homework #2

- Textbook: 1.4.15, 1.4.21, 1.4.23, 1.4.54, 1.4.56, 1.4.62, 1.4.68.

- Programming:

1. Write a function in Matlab that takes as input the number $n$, the size of matrices and vectors; $m$, the number of nonzero elements of a sparse matrix; and the sparse matrix whose nonzeros are given in $m$-component column vectors $r$, $c$, and $v$: the $r_k$ row, $c_k$ column entry of the matrix is nonzero with value $v_k$, for $k = 1, \ldots, m$. Finish the program in the following way:

   (a) Have the function output the actual $n \times n$ matrix $A$ represented. Write out or print out your function.

   (b) Have the function accept also the input of $x$, an $n$-component vector, and, working directly with the $r$, $c$, and $v$, output the matrix-vector multiplication between the sparse matrix and the vector $x$, and the number of flops involved. Write out or print out your function.

   (c) Assuming the sparse matrix is lower triangular and $c$ is in non-decreasing order, have the function accept also the input of $b$, an $n$-component vector, and, working directly with the $r$, $c$, and $v$, output column-oriented forward substitution solving for $A^{-1}b$, and the number of flops involved. Write out or print out your function.