CSci 8314 Practice Exercises Set #2 2– 18– 2019

1. Consider the following 7×7 lower triangular matrix.

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 2 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 3 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 4 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 5 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 6 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 7 \end{pmatrix} \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \end{matrix}$$

a. Show the Directed Acyclic Graph representing the dependencies when solving a linear system with A.
b. Show a DFS of the graph starting from node 1. Find a topological sort of the DAG.

2. Suppose that you want to solve a sparse triangular system with the above matrix when the right-hand side is $b = e_3$. Show how the solution algorithm should progress (show steps -no need to solve.) What is the nonzero pattern of the solution?