1. Using the graph below, show the start and finish times determined by DFS. Using those finish times, provide a topological sort of the nodes of the graph. As on the homework, visit nodes in alphabetical order.

![Graph Image]
2. We are given a weighted (positive weights) undirected graph $G = (V, E)$, and a set $F \subseteq V$ of special nodes. The nodes represent all locations in a city, and the set $F$ represents the locations of a firehouse. For planning purposes, we want to know, for each location in the city, the minimum distance to some firehouse. Describe (briefly) an $O((V + E) \lg V)$ algorithm to do this. Refer to known algorithms and describe the (simple) modification.
3. Illustrate the Floyd-Warshall algorithm on the graph with the following weight matrix

\[
\begin{pmatrix}
0 & 8 & \infty & \infty \\
8 & 0 & 5 & 3 \\
\infty & 5 & 0 & 6 \\
\infty & 3 & 6 & 0
\end{pmatrix}
\]

Show the intermediate matrices for \( k = 1, 2, 3, 4 \). Note that the graph is undirected (and hence the matrix is symmetric).
4. The Oregon Department of Transportation (ODOT) has decided to place a series of warning signs along a section of a major road. This is a one-way road and the dangerous sections are at mileposts \((m_1, m_2, \ldots, m_n)\). They wish to cover each of these locations, meaning that for each milepost there should be a sign at that point or at most \(k\) miles before it. Formally, for each milepost \(m_i\), it is covered if there is a sign at some \(m_j\) \((j \leq i)\) with \(m_i - m_j \leq k\).

Signs can only be placed at a milepost and there is a cost \(c_i\) to place a sign at \(m_i\). The input consists of \([m_1, m_2, \ldots, m_n], [c_1, c_2, \ldots, c_n]\), and \(k\). You can assume that the \(m_i\) are sorted \((m_i - 1 < m_i)\) and that \(c_i > 0\). The goal here is to determine the minimum total cost of a placement of signs at mileposts that covers all locations.

To start a dynamic programming solution, we define subproblem \(WS(i)\) to be the minimum placement cost of warning signs such that (i) there is a sign at location \(m_i\) and (ii) locations \(m_1, m_2, \ldots, m_{i-1}\) are also covered. The overall cost that we can report to ODOT is \(\min\{ WS(i) \mid 1 \leq i \leq n, m_n - m_i \leq k \}\).

**Give a recurrence relation for WS. Include the base case(s).**