Graph Search

Goals
- Describe applications of graph search
- Understand and answer problems related to generic graph search algorithm

Desired Properties of Graph Search
1. Find all nodes reachable from the starting node
2. Efficient (doesn’t explore same node over & over)

Input: $G = (V, E)$ starting node $s$
1. $Exp = \{s\}$  \quad $Exp = $ set of explored

2. While ($\exists (u,v) \in E: (u \in Exp \land v \notin Exp)$)
   \quad Add $v$ to $Exp$

Prove: Vertex $v$ is explored iff there is a path from $s$ to $v$

$\Rightarrow$ If $v$ is explored, we must have taken a sequence of edges from $s$ to $v$, so there must be a path from $s$ to $v$.

$\Leftarrow$ Contradiction. Suppose there is a path from $s$ to $v$, but $v$ is not explored.

Alg must have terminated with part of the path unexplored. But this contradicts how the alg. works, because there is an edge from explored nodes to unexplored nodes, so the alg. should not have terminated.
Multiple Choice

Q: Which nodes are reachable from s?
A) t, m
B) t, m, u
C) t, m, u, k
D) all nodes.

Q: Consider the graph:

Which sequence of explored vertices is not possible?
A) $s, t, u, w, x, v$

B) $s, u, v, x, w, t$

C) $s, u, v, t, x, w$

D) $s, t, w, x, u, v$