1. (25 points) Graph search and topological sorting

a. No the BFS algorithm given in lecture will not visit vertex 1.

b. Yes the DFS algorithm given in lecture will eventually visit all vertices, including vertex 1.

c. Sort the vertices in decreasing order of finishing time, we obtain the following topological order:
1, 0, 5, 2, 6, 4, 9, 3, 7, 8
2. (15 points) P and NP

a. False. P or NP is only defined for decision problems.

b. False. NP stands for non-deterministic polynomial time. It is neither proven nor disproven that NP problems cannot be solved in polynomial time.

c. True.

d. True.

e. False. \( \Pi_1 \leq_p \Pi_2 \) means \( \Pi_1 \) is no harder than \( \Pi_2 \). Therefore \( \Pi_1 \) is in NP does not mean \( \Pi_2 \) is also in NP.