1. Do a search in Google with the phrase “directed graph.” An example graph will show up on the first page. Show all steps of DFS on this example.

2. Explain, in your own words, why we construct $G^T$ in the strongly connected components algorithm for directed graphs. Show what goes wrong with an example if we replace $G^T$ by $G$ everywhere in the algorithm.

3. Compare time complexity of Bellman Ford used for the all pairs problem with that of the Floyd-Warshall algorithm on sparse graphs.

4. Explain carefully one example of polynomial-time reduction between two graph problems that we discussed in class. Justify why it is a polynomial-time reduction.

5. Prove the best possible upper and lower bounds (in P, NP-complete, NP-hard but not in NP, in NP but not NP-hard, in co-NP but not co-NP-hard, co-NP hard but not in co-NP, co-NP-complete) for the following problem: Given a boolean formula in disjunctive normal form, is the formula a tautology, i.e., does it evaluate to true for every possible truth assignment?

**Note:** Remember the academic honesty policy for the course.