CSCI 432/532, Spring 2025
Problem Session 15

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1. The *edge-disjoint path problem* takes in a directed graph G with special nodes s and t and asks for the largest number of paths from s to t that do not share any edges. (They may share vertices, however!)

   Describe a reduction from the edge-disjoint path problem to the maximum flow problem.

2. The *maximum matching problem* takes in a (undirected) bipartite graph G and asks for the largest collection of edges from G such that no two edges share an endpoint.

   Describe a reduction from the maximum matching problem to the maximum flow problem.

3. We can imagine a version of the maximum flow problem where vertices (except s and t) also have capacities, and we require that the total flow into (or, equivalently, out of) a vertex v to be less than or equal to that capacity. (Note that we still have edge capacities in this version.) We call this the *vertex-capacitated maximum flow problem*.

   Give a reduction from the vertex-capacitated maximum flow problem to the maximum flow problem.