University of Bremen

FB3: Mathematik/Informatik

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Advanced Algorithms

Exercise Sheet 0

Submission: none.
This exercise will be discussed on Wednesday, April 9, 2025.

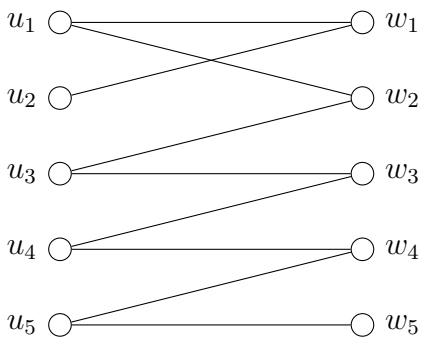
Exercise 0.1 (Algorithm for maximum bipartite matching)

We are given the bipartite graph below. Compute a maximum matching

a) using the reduction to maximum flows, and

b) using the augmenting path algorithm.

In b), start with the matching $M = \{u_1w_1, u_3w_2\}$.



Exercise 0.2 (Maximum matchings and augmenting paths)

Show the following theorem from the lecture:
Let M be a matching in a graph $G = (V, E)$. M is maximum if and only if there is no M-augmenting path.

Exercise 0.3 (Augmenting Paths and paths in the directed graph)

Show the following lemma from the lecture:
Let M be a matching in a bipartite graph $G = (L \cup R, E)$. There is an M-augmenting path in G if and only if there is a directed path in D_M from an exposed vertex $u \in V$ to an exposed vertex $v \in V$, $u \neq v$.