1. **Network Flow (Niveau I)**

Assume a flow network with edge and additional vertex capacities. Each vertex \( v \) has a limit on the flow that can pass through it. Explain how to transform this flow network into an equivalent flow network without vertex capacities.

2. **Matching and Bipartite Graphs (Niveau I)**

   (a) Apply the matching augmenting algorithm for bipartite graphs to the graph below and compute a maximum cardinality matching from the initial matching.

3. **Maximal and maximum matchings (Niveau II)**

   Prove that every *maximal* matching in a graph \( G \) has size at least half the size of a *maximum* matching.