Algorithms
WS 2015/16
Exercise 3
(discussed on November 6th, 2015)

Prepare yourself to present your solutions to your fellow students.

1. **Ford-Fulkerson (Niveau I)**
   
   (a) Use the Ford-Fulkerson algorithm to find a maximum flow in the network

   ![Network Diagram](image)

   Start with the initial flow $f$. An edge label $f/c$ means initial flow $f$ and capacity $c$.

   (b) Find a minimum cut proving the maximality of the flow.

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. Marriage Theorem (Niveau II)

Prove that a bipartite graph \( G = (A \cup B, E) \), with \(|A| = |B| = n\), has a perfect matching if and only if for all \( B' \subseteq B \), \(|B'| \leq |N(B')|\), where \( N(B') \) is the set of all neighbors of nodes in \( B' \).