

Last name _____

First name _____

LARSON—MATH 556—CLASSROOM WORKSHEET 11
NP-properties and the Hungarian Method

Concepts & Notation

- *assignment problem, graph G , points $V(G)$, lines $E(G)$, adjacent, incident.*
- *line covering, line covering number ρ , matching, matching number ν , point covering, point covering number τ , independent set, independence number α .*

Review

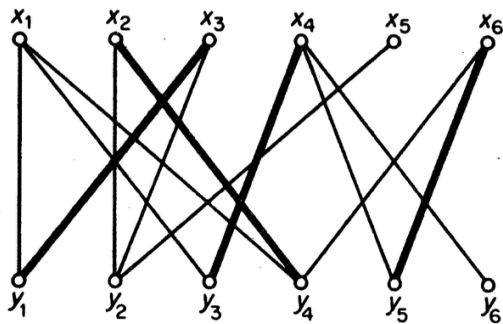
- **König's Theorem:** For any bipartite graph, $\tau = \nu$.
- What is *Hall's Theorem*?
- What is *Frobenius's (Marriage) Theorem*?
- How do we extend the concept of “a *property* being well-characterized” to that of “an *invariant* being well-characterized”?
- What is an example of “an *invariant* being well-characterized”?

1. What is a *minimax theorem*?

2. What is the **importance** of minimax theorems?

3. Let M be a matching in a graph. What is an M -alternating path?

4. Let M be a matching in a graph. What is an M -augmenting path?



5. Let M be the highlighted lines. Find an M -augmenting path in this graph.

6. What is Berge's Theorem?

7. Why is Berge's Theorem true?

8. What is the *Hungarian Method*?

9. Why does the Hungarian method produce a *provably* maximum matching in a bipartite graph?