

Name:

**MA 515 – Homework 6**  
**Due Fri, Oct 17<sup>th</sup>**

Your answers should be detailed explanations written neatly in quality mathematical English.

**Problems from J. Lee's book:**

Page 43, Problems (Unimodularity and Pivoting) and (Unimodularity and Connections)

**Problem 1:** Prove that if  $A$  is totally unimodular, so are  $A^T$  and  $[A, I]$ .

**Problem 2:** A *vertex packing* in a graph is a set of vertices, no two of which are joined by an edge. A *covering* of vertices by edges in a graph is a set of edges such that every vertex is an endpoint of at least one of these edges. Prove the following, using the techniques similar to those that we used for the proof of Konig's Theorem.

If  $G$  is a bipartite graph such that every vertex is incident to at least one edge, then the size of a maximum cardinality vertex packing equals the size of a minimum cardinality covering of vertices by edges.