Matroid Theory Tutorials:
(7) Regular Matroids

Homework

HW 1. Show that an incidence matrix of a graph G is totally unimodular if and only if the graph G is bipartite. (Incidence matrix of a graph G is a 0/1-matrix M such that its rows are indexed by vertices of G and columns are indexed by edges of G and for a vertex v and an edge e, $M_{v,e} = 1$ if and only if $v \in e$.)

HW 2. Consider the following matrix (matroid):

$$R_{10} = \left(\begin{array}{c|ccccc} & 1 & 1 & 0 & 0 & 1 \\ & 1 & 1 & 1 & 0 & 0 \\ I_5 & 0 & 1 & 1 & 1 & 0 \\ & 0 & 0 & 1 & 1 & 1 \\ & 1 & 0 & 0 & 1 & 1 \end{array}\right)$$

- What is a dual of the matroid R_{10}?
- Is R_{10} a graphic matroid?
- Is it possible to add minuses (change 1 to -1) to the right sumbatrix 5×5 of R_{10} such that the matrix R_{10} is totally unimodular?