Massachusetts Institute of Technology
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18.453: Combinatorial Optimization
March 2nd, 2017

Problem set 2

This problem set is due in class on March 9th, 2017.

1. Exercise 2-3 from the notes on (non-bipartite) matchings.
2. Exercise 2-6 from the notes on (non-bipartite) matchings.
3. Consider $S = \{(1,0,1),(0,1,1),(1,1,1)\} \subseteq \mathbb{R}^3\}$. Describe $\text{lin}(S)$, $\text{aff}(S)$, $\text{cone}(S)$ and $\text{conv}(S)$ (as a polyhedron, in terms of the linear equalities/inequalities).
4. Let $G = (V, E)$ be a bipartite graph having a perfect matching. Consider the set $\mathcal{M} \subseteq \mathbb{R}^E$ of the incidence vectors of all perfect matchings of G. We have seen a description of $\text{conv}(\mathcal{M})$ as a system of linear inequalities/equalities. Give a description (and a proof) of the conic hull, $\text{cone}(\mathcal{M})$, as the solution set of system of linear inequalities and equalities.
5. For graduate students, exercise 2-7.