Technische Universität Berlin Sommer 2004
Fakultät II – Institut für Mathematik Stand 14. Juni 2004
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Sekretariat MA 6-2
`http://www.math.tu-berlin.de/Vorlesungen/SoSe04/KombGeoI/`

Seventh Problem Set 'Discrete Geometry'

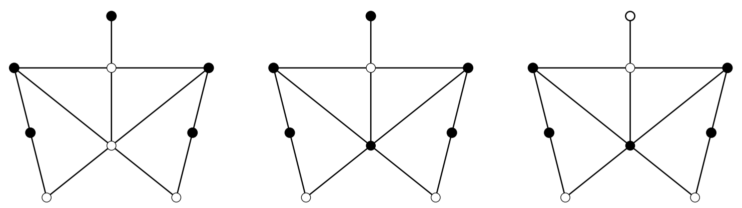
Gale Diagrams

Deadline: *Wednesday, June 23, 2004*

Homework

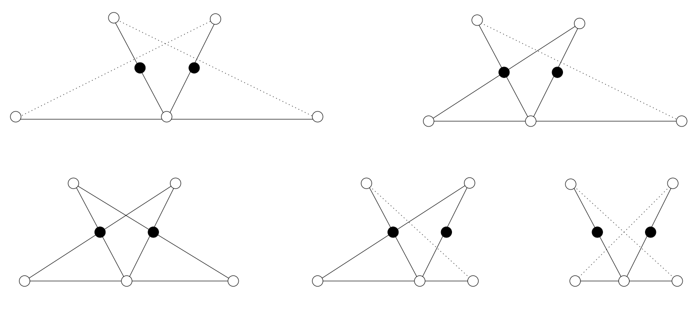
1. Prove *Radon's theorem*:
Given any set V of $d+2$ points in $\mathbb{R}^d$, we can find disjoint nonempty subsets $V_1, V_2 \subseteq V$ such that $\operatorname{relint}(V_1) \cap \operatorname{relint}(V_2) \neq \varnothing$. Why can we assume that $\operatorname{conv}(V_i)$ are simplices? **5 points**

2. Which of the following point configurations are affine Gale diagrams of polytopes? Why, or why not?



5 points

3. Consider the following diagrams. Verify that they are affine Gale diagrams and construct the associated polytopes.



Hint. Consider the one you like best first and then describe how you have to modify your polytope in order to get the others. **5 points**

Σ 15 points