First name _____

LARSON—OPER 731—CLASSROOM WORKSHEET 13 Duality!

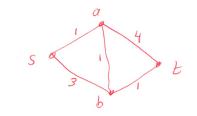
Concepts

- (Sec. 2.4) basis, basic variable, nonbasic variable, basic solution, basic feasible solution, canonical form.
- (Sec. 2.8) hyperplane, halfspace, line, line segment, convex, polyhedron, tight inequality, extreme point.
- (Sec. 3.1) dual LP, Weak duality theorem.
- 1. (Homework:) Find the extreme points of the *n*-dimensional hypercube:

$$\{x \in \mathbb{R}^n : 0 \le x_i \le 1\}.$$

2. What is the Strong Duality Theorem?

3. Find the (weighted) shortest-path IP.



4. Find the dual for the (weighted) shortest-path IP and try to interpret its meaning.

5. What is an example of a minimum cost perfect matching problem?

6. Model the problem as an IP.

7. Find its dual and try to interpret its meaning.

8. Given a dual feasible y, what is the *reduced cost* of an edge?

9. Given a minimum cost perfect matching IP and dual feasible y, explain why an optimal solution of the IP with reduced cost edges is an optimal solution of the original IP.