

Math 354:H1 extra practice for the final exam

These practice problems are intended to supplement the strongly recommended problem list and the practice set for the second midterm. The list of topics covered by the exam is not limited to those addressed below.

1. Review the proof of the Weak Duality Theorem (pp.172-173). You won't have to produce this proof on the exam, but you should understand its logic.

2. Review the argument (pp. 78-79) that if $\mathbf{u}$ and $\mathbf{v}$ are feasible solutions of a LPP, then any point $\mathbf{x}$ on the line segment joining $\mathbf{u}$ and $\mathbf{v}$ is also a feasible solution.

3. Look again at problem 3 on the first midterm. This LPP has no feasible solutions. Now change the inequality in the first constraint, so that the LPP becomes

Maximize $z = 3x_1 + x_2$ subject to

$$-3x_1 + x_2 \leq 6$$

$$3x_1 + 5x_2 \leq 15$$

$x_1, x_2 \geq 0$ As in the first midterm, solve geometrically, i.e. graph the set of feasible solutions, find the extreme points, and find an optimal solution. Then check your answer using what you know about duality.

4. Look again at problem 3 on the second midterm.

Answer part a) for all the coefficients in the objective function.

Answer part b) for all the entries in $\mathbf{b}$.

5. Look again at problem 5 on the second midterm. The tableau presented there does not quite match the stated LPP; there is a misprint in the tableau. How can you tell that there is something wrong without redoing the simplex method from scratch?

6. If, in the course of applying the simplex method, you make the mistake of choosing the wrong departing variable, what will go wrong at the next step?

If, in the course of applying the dual simplex method, you make the mistake of choosing the wrong entering variable, what will go wrong at the next step?

7. When solving problem 5 in section 4.2, express each cutting plane you create in terms of x_1 and x_2 alone.

8. When solving problems 3 and 5 in section 5.4, as soon as a cut is achieved, write down which arcs are in that cut and compute its total capacity; also write the sets S and T . Recall that S is the set of nodes for which there is a path from the source to that node along arcs with positive unused capacity, and T is the set of all nodes not in S .