

Mathematics 2, Part 4, Homework 2

I. DUALS AND DUALS AND DUALS

1)

For the first task, as instructed we can rewrite the (D) problem in the standard form:

$$\begin{aligned} \max & -b^\top y \\ -A^\top y & \leq -c \\ y & \geq 0 \end{aligned}$$

Then we can dualize according to the given pattern to get:

$$\begin{aligned} \max & -c^\top x \\ -A^\top x & \geq -b \\ x & \geq 0 \end{aligned}$$

And finally by multiplying with -1, we get back to the (P) problem:

$$\begin{aligned} \max & c^\top x \\ A^\top x & \leq b \\ x & \geq 0 \end{aligned}$$

2)

For this problem we took the (P) and (D) problem from [1]:

$$\begin{array}{ll} \text{(P):} & \text{(D):} \\ \min c^\top x & \max b^\top y \\ Ax = b & A^\top y + s = c \\ x \geq 0 & s \geq 0, y \in \mathbb{R}^m \end{array}$$

We show that they are dual by starting from the (P) problem.

REFERENCES

- [1] Kurt Mehlhorn and Sanjeev Saxena. A still simpler way of introducing interior-point method for linear programming. *Computer Science Review*, 22:1–11, 2016.