Queen Mary University of London

MTH5114 Linear Programming and Games, Spring 2024

Week 8 Seminar Questions **Viresh Patel**

Practice and Discussion Questions:

1. Give the dual of the following linear program:

$$\begin{aligned} \text{minimize} \quad & 3x_1 + 7x_3 + 9x_4 \\ \text{subject to} \quad & -x_1 + 3x_2 - x_3 - 10x_4 \leq -12, \\ & 2x_1 + 5x_2 + 8x_3 + 9x_4 \geq 1, \\ & x_1 + 4x_2 + 8x_3 + x_4 \geq 0, \\ & x_1, x_2 \geq 0, \\ & x_3 \leq 0, \\ & x_4 \text{ unrestricted} \end{aligned}$$

2. Show that if a linear program is unbounded, its dual must be infeasible.

3. Can a linear program and its dual both be unbounded? Can both be infeasible?

4. In lecture, we saw how to find the dual of an LP that is not in standard inequality form. We saw that equations in the primal LP became unrestricted variables in the dual LP (and vice versa). What if instead, we converted the primal LP to standard inequality form and then took the dual? Is this consistent?