

Tutorials
Optimisation
2018
Exercise Sheet 6

Exercise 11:

Construct the duals of the following LPs.

$$\begin{array}{ll} \min & -x_1 + 2x_2 - 3x_3 + x_4 \\ \text{s.t.} & 2x_1 + x_2 - x_3 + x_4 \leq 10 \\ & x_1 - 2x_2 - 9x_3 - 5x_4 \geq 6 \\ & x_1, x_2, x_3, x_4 \geq 0 \end{array} \quad (1)$$

$$\begin{array}{ll} \min & -x_1 + 4x_2 \\ \text{s.t.} & 3x_1 + 2x_2 \geq 9 \\ & x_1 + 2x_2 \geq 3 \\ & x_1 \text{ free} \\ & x_2 \geq 0 \end{array} \quad (2)$$

$$\begin{array}{ll} \min & \alpha x_1 + \beta x_2 \\ \text{s.t.} & \gamma x_1 + \delta x_2 \leq b_1 \\ & \epsilon x_1 + \zeta x_2 \leq b_2 \\ & x_1, x_2 \text{ free} \end{array} \quad (3)$$

$$\begin{array}{ll} \max & 3x_1 + x_2 + 3x_3 \\ \text{s.t.} & 2x_1 + x_2 + x_3 \leq 2 \\ & x_1 + 2x_2 + 3x_3 \geq 5 \\ & 2x_1 + 2x_2 + x_3 \leq 6 \\ & x_1, x_3 \geq 0 \\ & x_2 \text{ free} \end{array} \quad (4)$$

$$\begin{array}{ll} \min & c^T x \\ \text{s.t.} & Ax \leq b \\ & Bx = d \\ & x \geq 0 \end{array} \quad (5)$$