

Math 294 Practice: LP dual problem

Consider the primal problem

$$p^* = \min_{x \in \mathbb{R}^3} (3x_1 + 4x_2 + 5x_3)$$

subject to

$$\begin{aligned} 6x_1 + 7x_2 + 8x_3 &\geq 9, \\ 10x_1 + 11x_2 + 12x_3 &\geq 13, \\ x_1, x_2, x_3 &\geq 0. \end{aligned}$$

1. Write out the Lagrangian function for this problem.
2. Derive the dual problem and sketch the feasible set in the λ_1 - λ_2 plane.
3. Solve the dual problem: state d^* , λ_1^* , λ_2^* , λ_3^* , λ_4^* , and λ_5^* .
4. Use these value to recover p^* , x_1^* , x_2^* , and x_3^* .