In-Class Worksheet

CS 181 Advanced Algorithms — Spring 2026

Consider the following linear program (LP):

$$\begin{aligned} \max\ & 2x_1 + 7x_2 + 4x_3 \\ \text{s.t.}\ & x_1 + 2x_2 + x_3 \leq 10, \\ & 3x_1 + 3x_2 + 2x_3 \leq 10, \\ & x_1, x_2, x_3 \geq 0. \end{aligned}$$

Show that the optimal value cannot exceed 25.

Duality in Matchings

1. Formulate the maximum matching problem as an Integer Program.
2. Consider the linear relaxation and call this (P)
3. Take the dual of (P) to obtain the dual linear program (D).
4. Impose integer constraints on the variables in (D). What familiar problem does this capture?