19 settembre 2024

Exercise 2: consider the standard form polyhedron $P = \{x \mid Ax = b, x \geq 0\}$. Suppose that the matrix A of dimension $m \times n$ has linearly indipendent rows, and all basic feasible solutions are non-degenerate. Let x be an element of P that has exactly m positive components.

i. Show that x is a basic feasible solution
ii. Show that the result of part (i) is false if the non-degeneracy assumption is removed.

Sia $\mathcal{B} = \{i : x_i \neq 0\}$, $A_{\mathcal{B}}$ e' una matrice $m \times m$, data l'assunzione che A ha le righe lin. indipendenti $\Rightarrow A_{\mathcal{B}}$ ha rango m ed e' non singolare $\Rightarrow \mathcal{B}$ e' una base valida ed x e' la BFS associata. Se l'ipotesi sulle sol. non degenere fosse Falsa, non si potrebbe affermare che $\mathcal{B}$ e' la base correlata ad x.

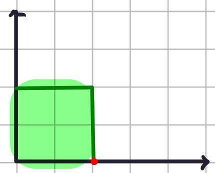
settembre 2023

Exercise 3: show an example of linear problem (P) and its dual (D) such that:

a) (P) is feasible and (D) is feasible
b) (P) is unfeasible and (D) is unfeasible

a) Se un LP e' ammissibile e limitato, anche il suo duale lo e'.

$$(P) = \begin{cases} \max & x_1 \\ \text{s.t.} & x_1 \leq 1 \\ & x_2 \leq 1 \\ & x \geq 0 \end{cases} \Rightarrow (D) = \begin{cases} \min & y_1 + y_2 \\ & y_1 + y_2 \leq 1 \\ & y \geq 0 \end{cases}$$

(P) 

(D) 

b)

$$(P) = \begin{cases} \max & x_3 \\ & -x_1 + x_2 + x_3 = 1 \\ & -x_1 + x_2 + x_3 = 0 \\ & x \in \mathbb{R}^3 \end{cases} \qquad (D) = \begin{cases} \min & y_1 \\ & -y_1 - y_2 = 0 \\ & y_1 + y_2 = 0 \\ & y_1 + y_2 = 1 \\ & y \in \mathbb{R}^2 \end{cases}$$