



SAPIENZA
UNIVERSITÀ DI ROMA

Programmazione lineare

Catalogo dei problemi

I problemi di programmazione lineare usati negli esempi e negli esercizi di tutto il corso, citati con la loro sigla P0–P86: problemi con due e tre variabili, divisi in quattro tipi (A: termini noti non negativi; B: simplesso duale; C: serve la Fase 0; D: problemi illimitati, inammissibili o con ottimi multipli). Per ciascuno il problema e la figura della regione ammissibile.

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Versione online e materiale scaricabile:
fabiofurini.github.io/programmazione-lineare/
github.com/fabiofurini/programmazione-lineare

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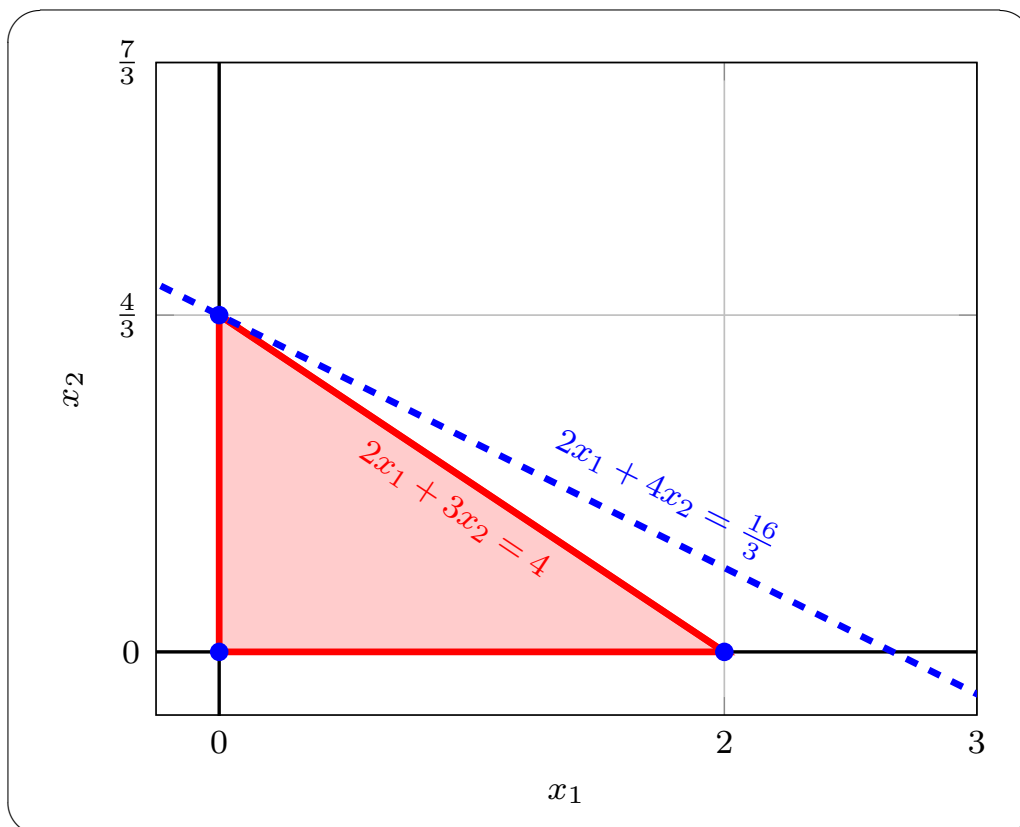
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Problemi LP con due variabili – Tipo A

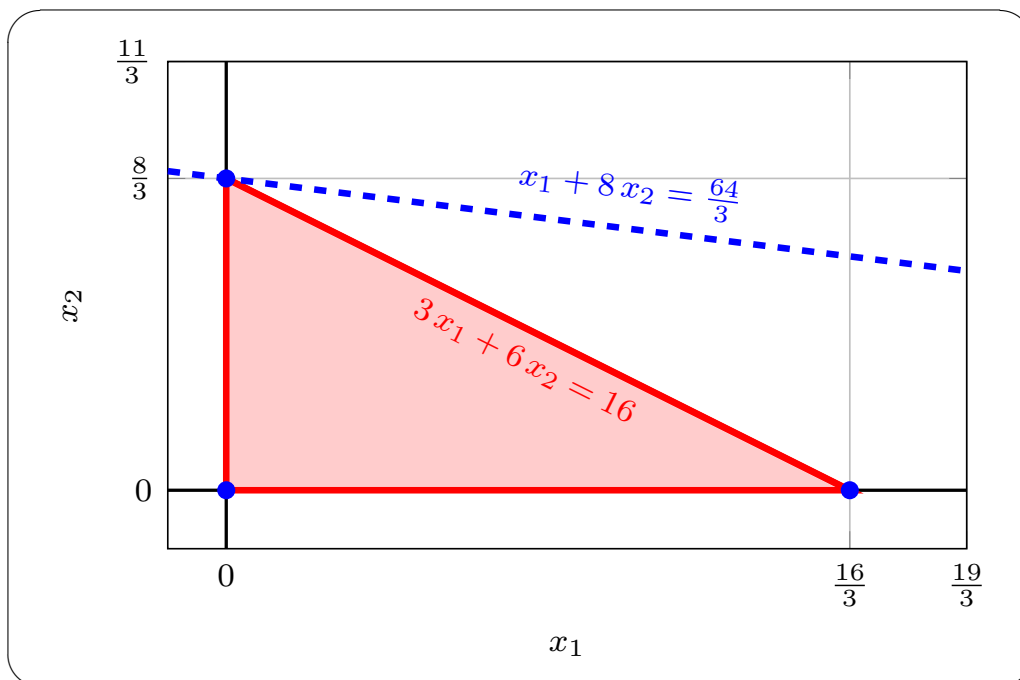
1.1 Problema LP P_0

$$\begin{aligned} \max \quad & 2x_1 + 4x_2 \\ \text{soggetto a} \quad & 2x_1 + 3x_2 \leq 4 \\ & x_1, x_2 \geq 0 \end{aligned}$$



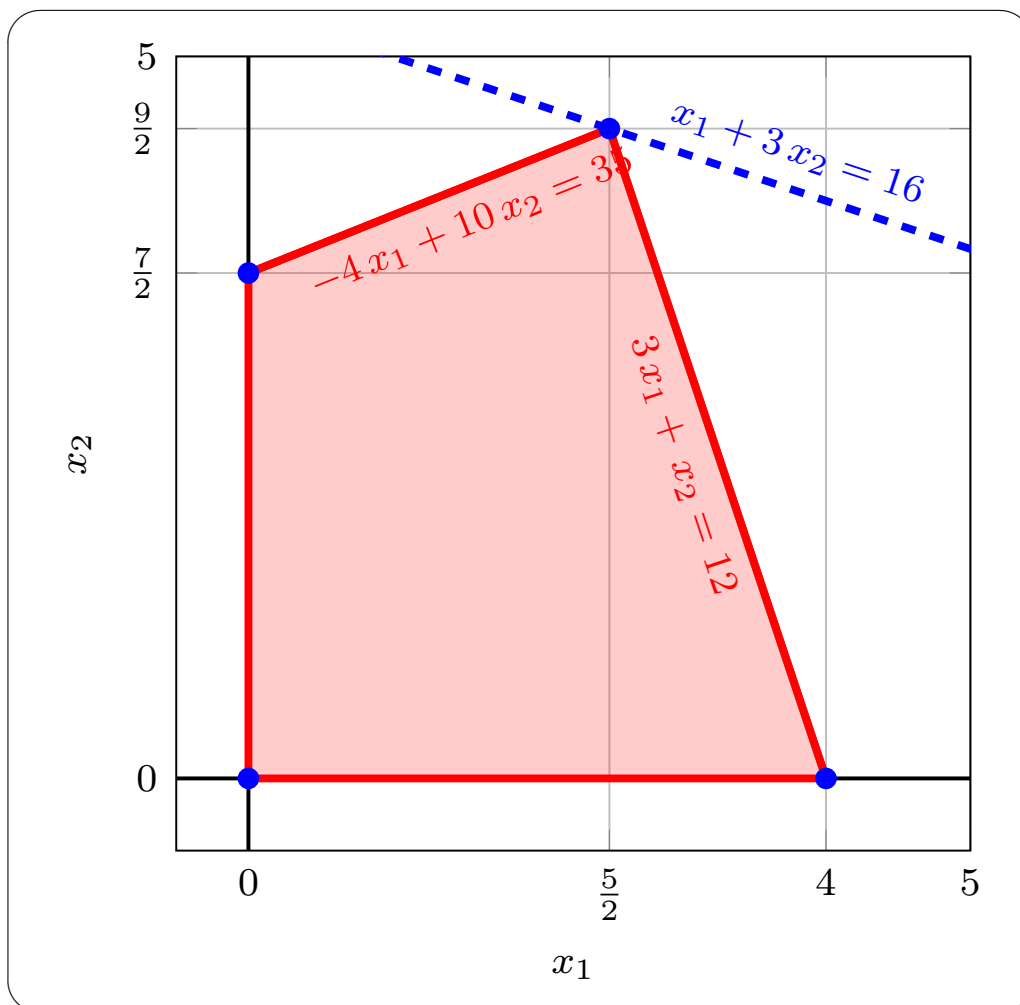
1.2 Problema LP $P1$

$$\begin{aligned} \max \quad & x_1 + 8 x_2 \\ \text{soggetto a} \quad & 3 x_1 + 6 x_2 \leq 16 \\ & x_1, \quad x_2 \geq 0 \end{aligned}$$



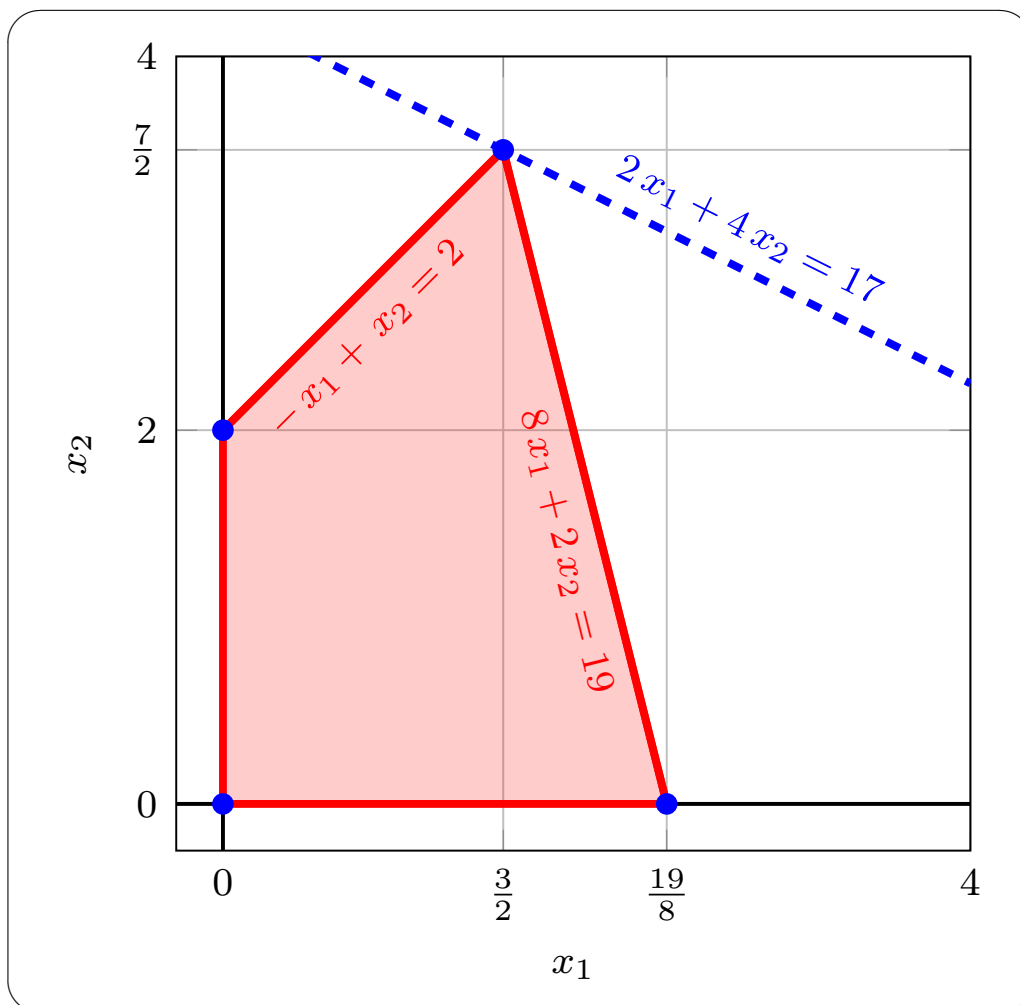
1.3 Problema LP P_2

$$\begin{aligned} \max \quad & x_1 + 3x_2 \\ \text{soggetto a} \quad & -4x_1 + 10x_2 \leq 35 \\ & 3x_1 + x_2 \leq 12 \\ & x_1, x_2 \geq 0 \end{aligned}$$



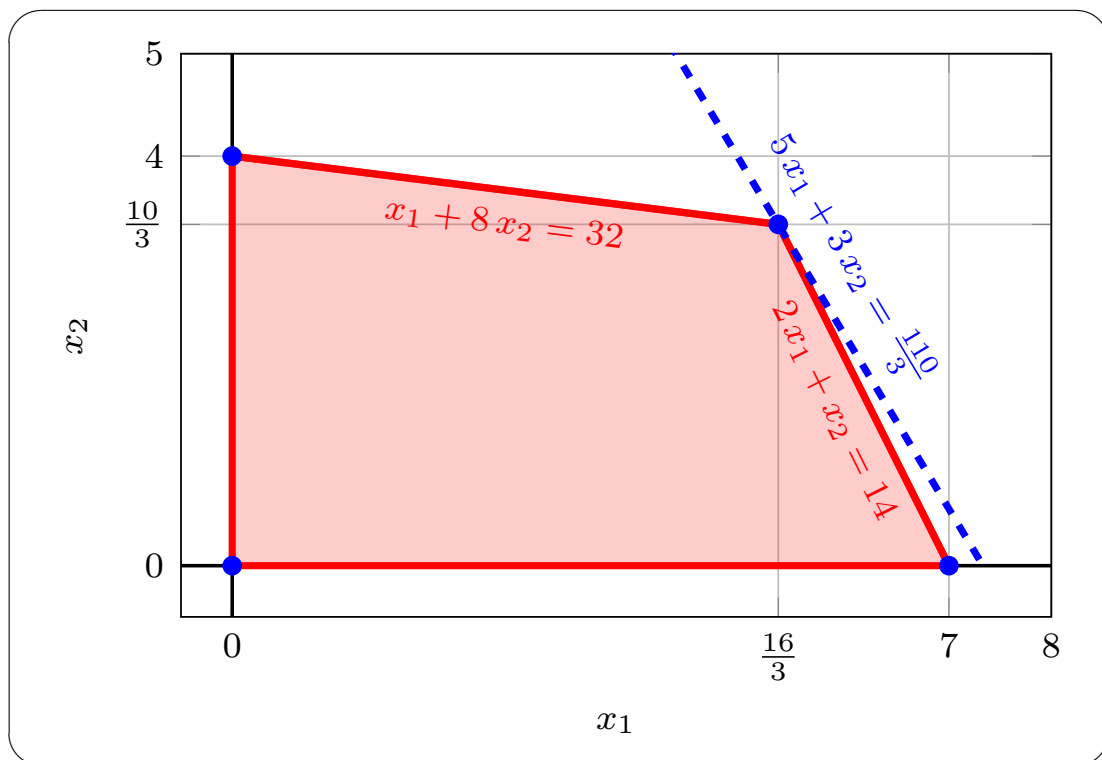
1.4 Problema LP $P3$

$$\begin{array}{ll} \max & 2x_1 + 4x_2 \\ \text{soggetto a} & -x_1 + x_2 \leq 2 \\ & 8x_1 + 2x_2 \leq 19 \\ & x_1, x_2 \geq 0 \end{array}$$



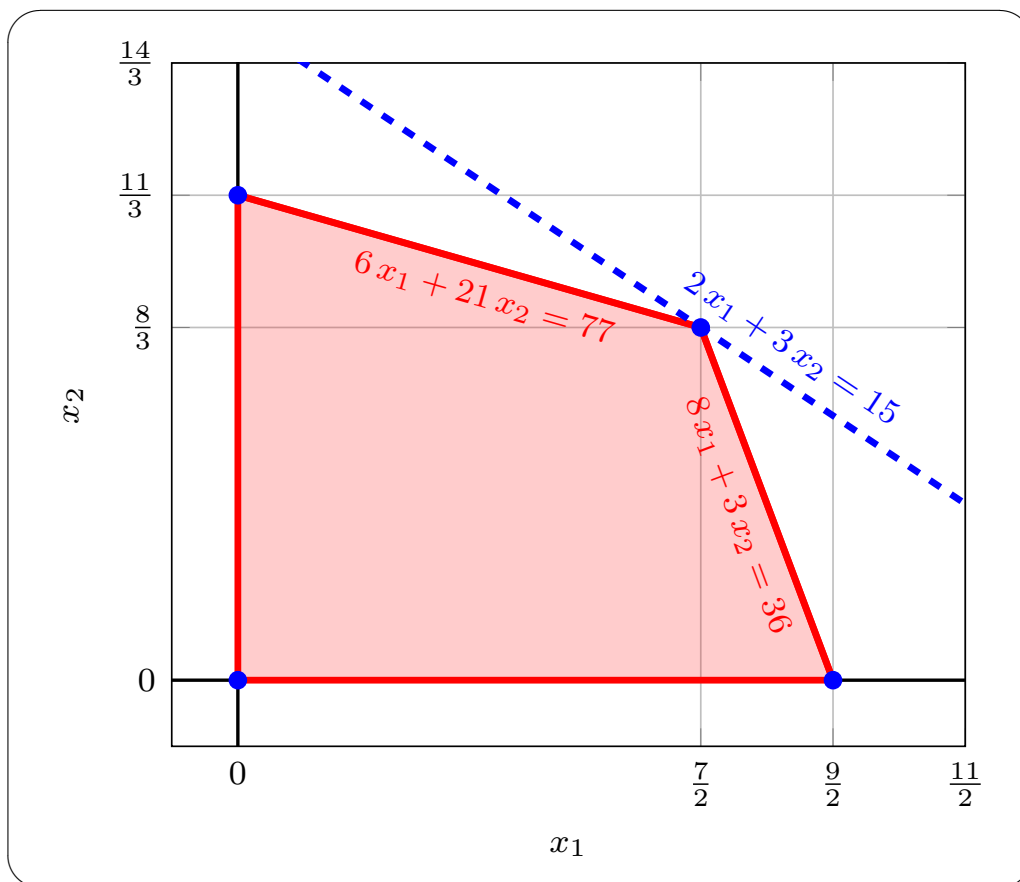
1.5 Problema LP P_4

$$\begin{aligned} \max \quad & 5x_1 + 3x_2 \\ \text{soggetto a} \quad & 2x_1 + x_2 \leq 14 \\ & x_1 + 8x_2 \leq 32 \\ & x_1, x_2 \geq 0 \end{aligned}$$



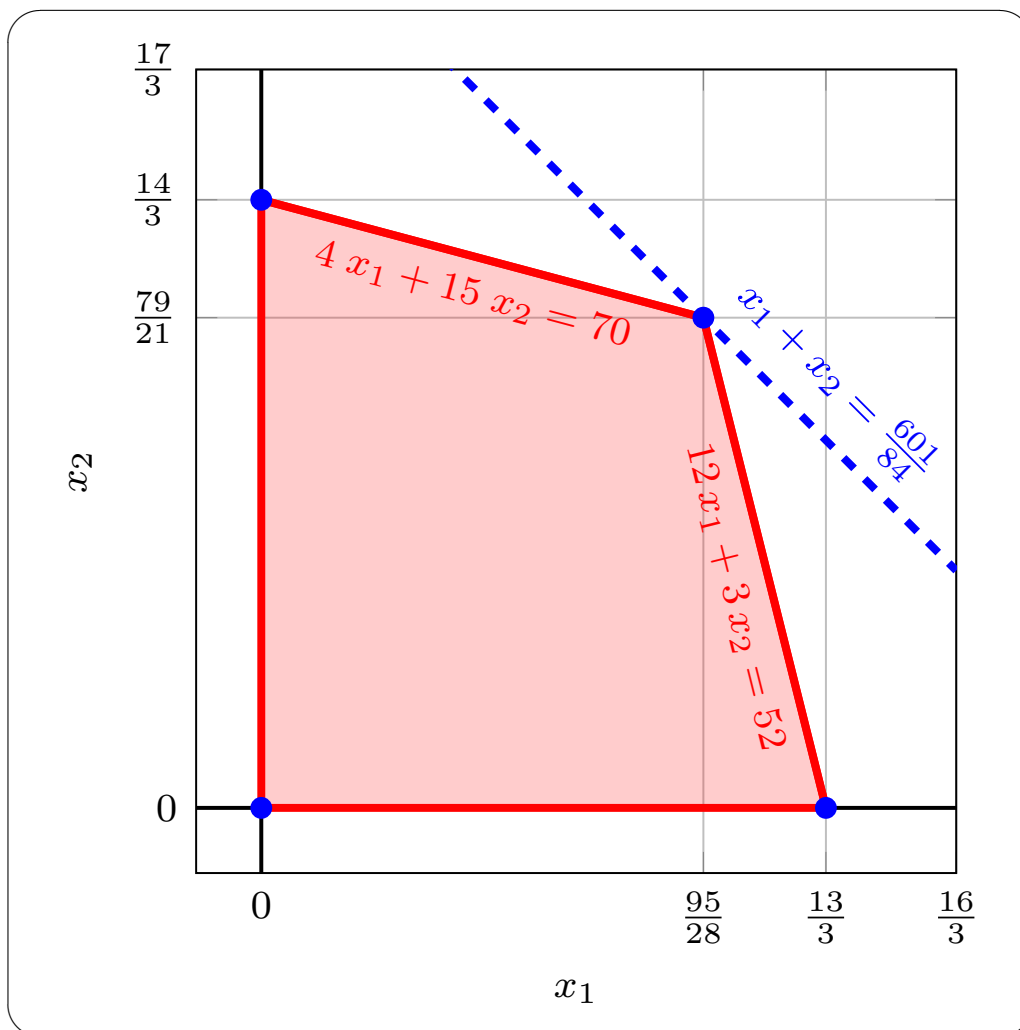
1.6 Problema LP P5

$$\begin{aligned} \max \quad & 2x_1 + 3x_2 \\ \text{soggetto a} \quad & 6x_1 + 21x_2 \leq 77 \\ & 8x_1 + 3x_2 \leq 36 \\ & x_1, x_2 \geq 0 \end{aligned}$$



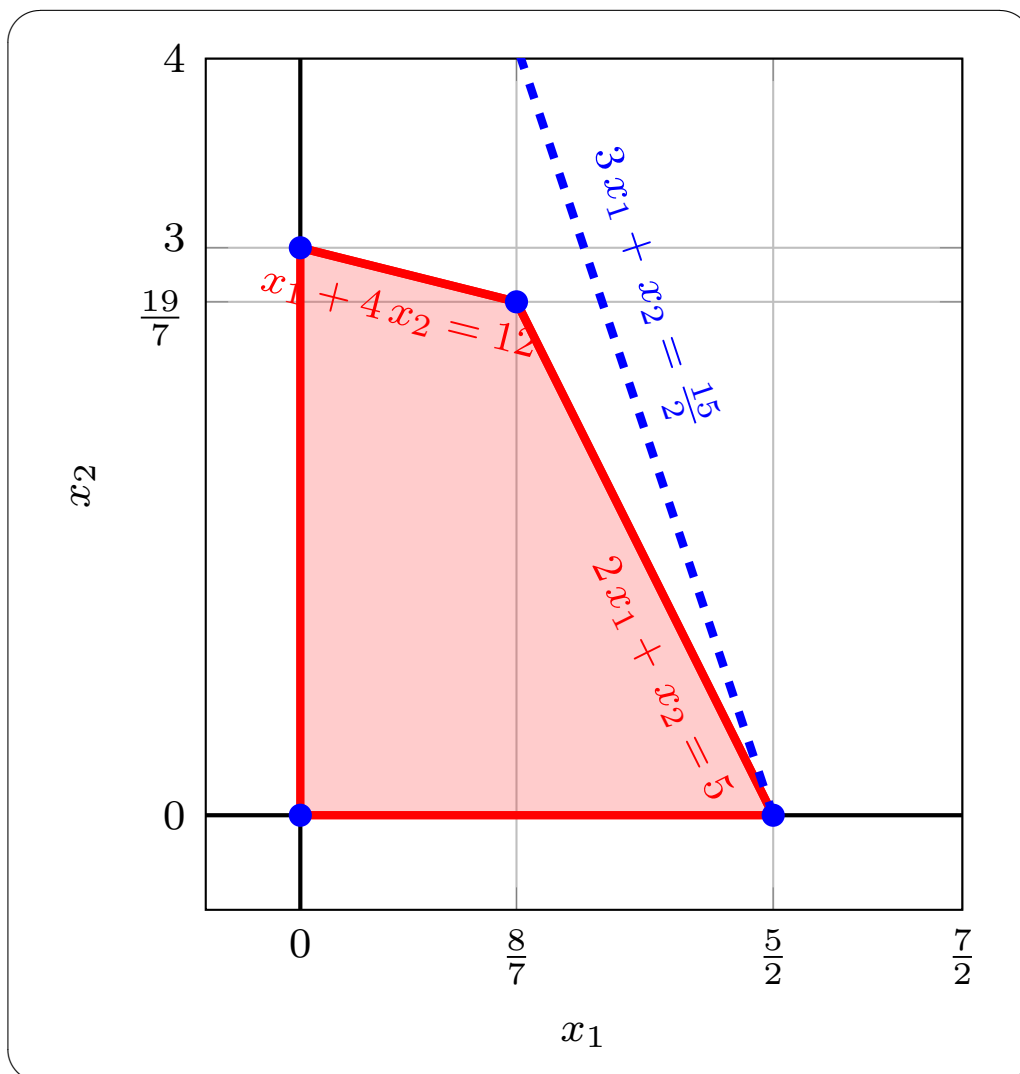
1.7 Problema ILP P_6

$$\begin{array}{llllll}
 \max & & x_1 & + & & x_2 \\
 \text{soggetto a} & 4 & x_1 & + & 15 & x_2 \leq 70 \\
 & 12 & x_1 & + & 3 & x_2 \leq 52 \\
 & & x_1, & & x_2 & \in \mathbb{Z}_{\geq 0}
 \end{array}$$



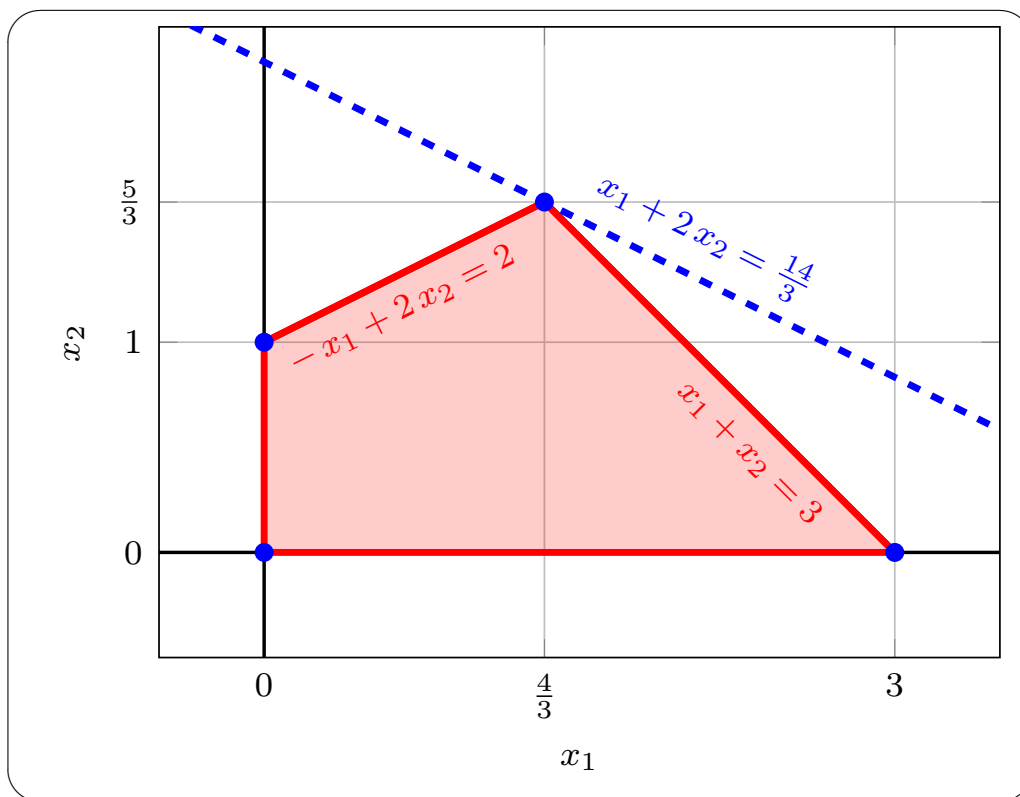
1.8 Problema LP P7

$$\begin{aligned}
 &\max \quad 3x_1 + x_2 \\
 &\text{soggetto a} \quad x_1 + 4x_2 \leq 12 \\
 &\quad \quad \quad 2x_1 + x_2 \leq 5 \\
 &\quad \quad \quad x_1, \quad x_2 \geq 0
 \end{aligned}$$



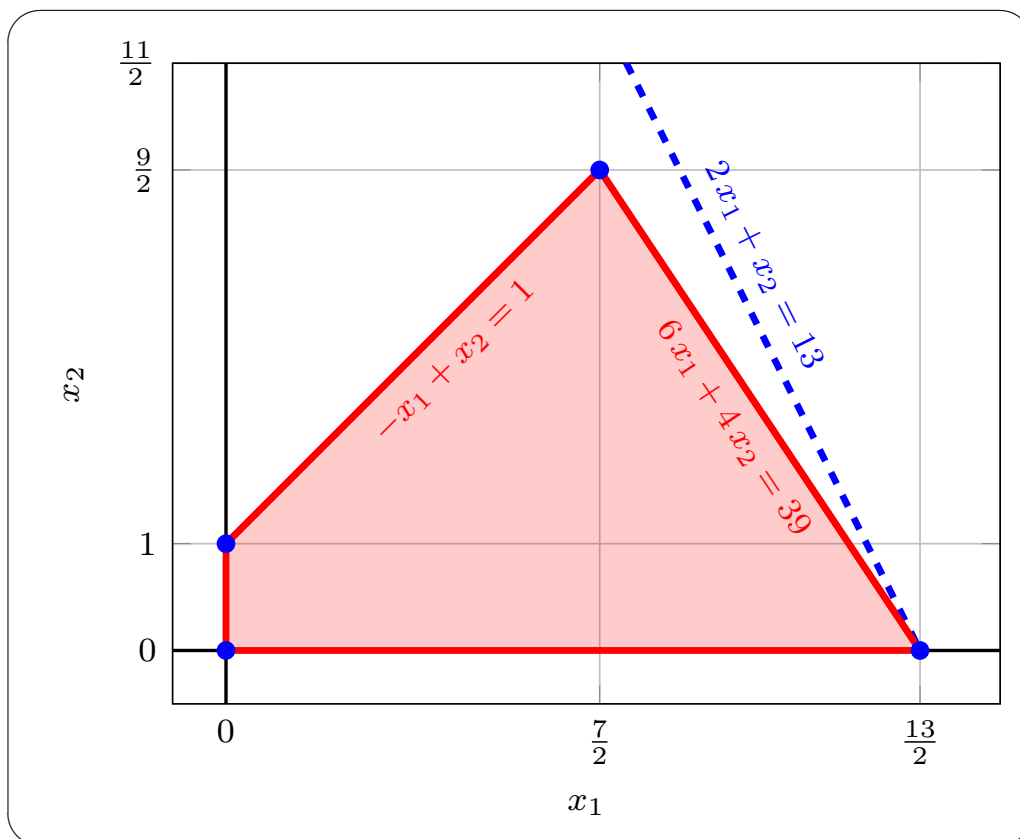
1.9 Problema LP $P8$

$$\begin{aligned} \max \quad & x_1 + 2x_2 \\ \text{soggetto a} \quad & -x_1 + 2x_2 \leq 2 \\ & x_1 + x_2 \leq 3 \\ & x_1, x_2 \geq 0 \end{aligned}$$



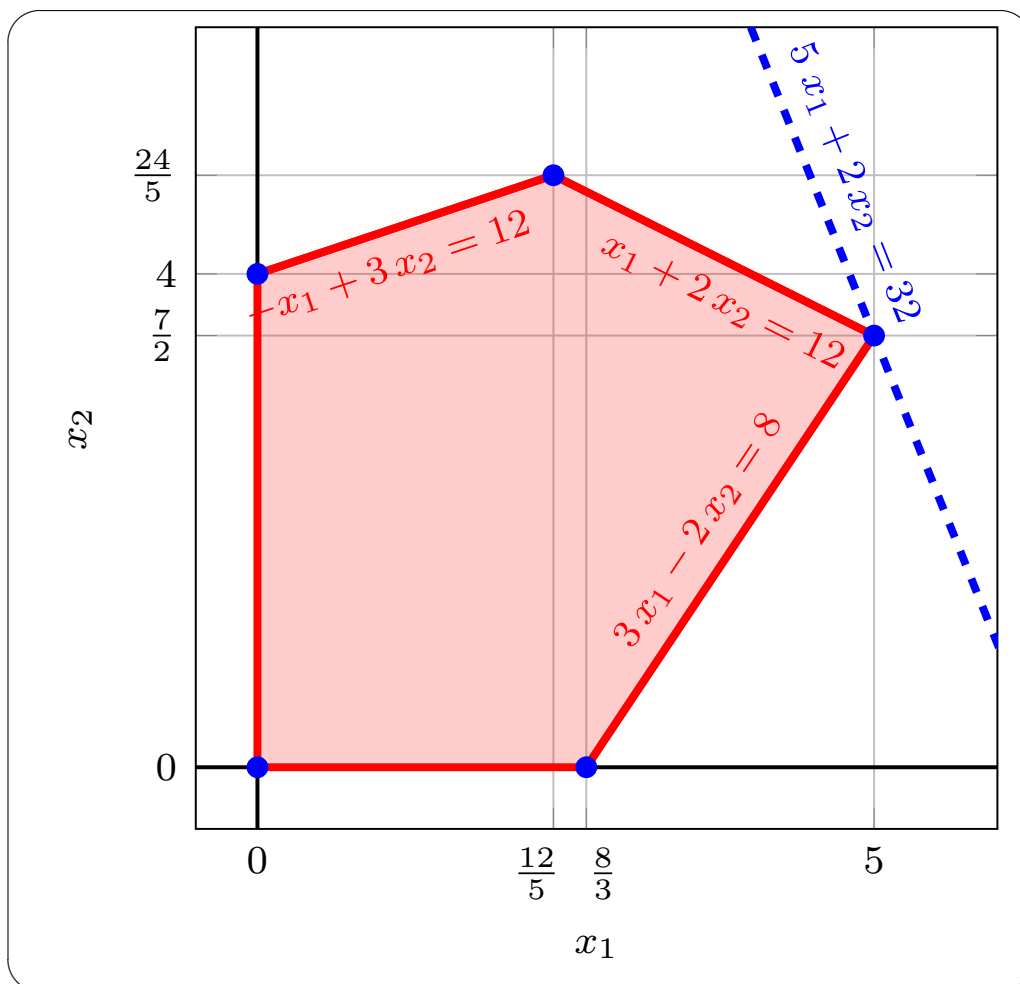
1.10 Problema LP P_9

$$\begin{array}{llllll} \max & 2 & x_1 & + & & x_2 \\ \text{soggetto a} & - & x_1 & + & & x_2 \leq 1 \\ & 6 & x_1 & + & 4 & x_2 \leq 39 \\ & & x_1, & & & x_2 \geq 0 \end{array}$$



1.11 Problema LP P10

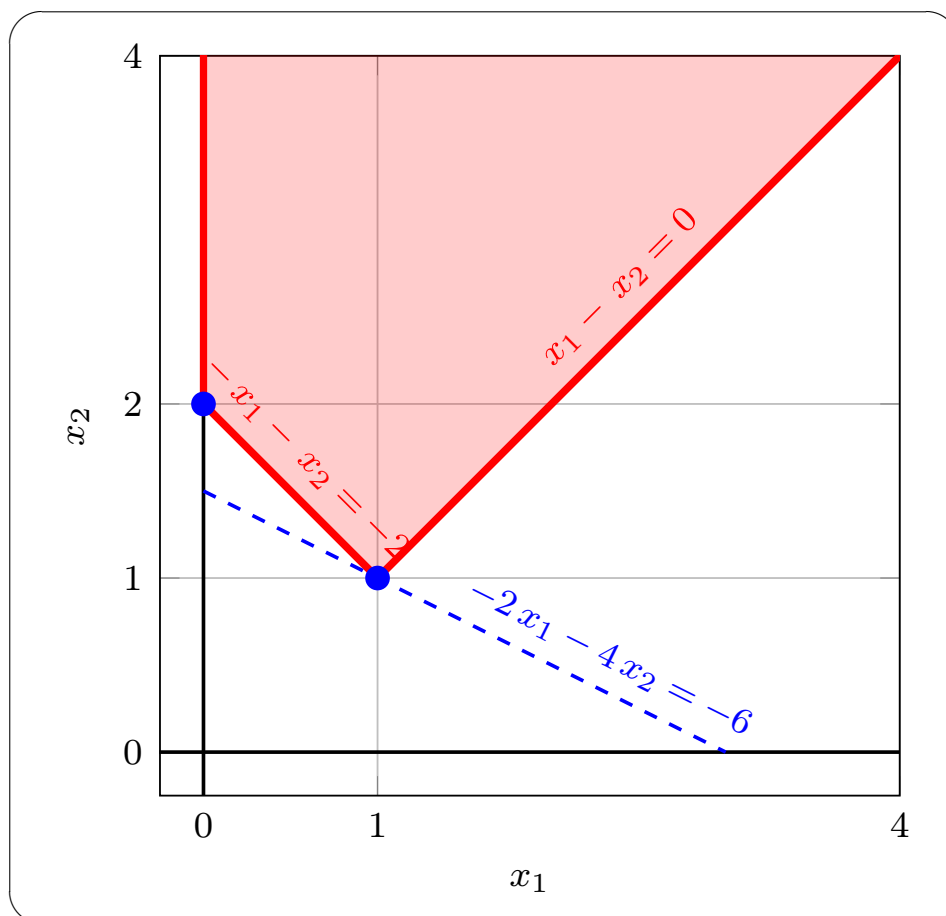
$$\begin{aligned}
 \max \quad & 5x_1 + 2x_2 \\
 \text{soggetto a} \quad & -x_1 + 3x_2 \leq 12 \\
 & x_1 + 2x_2 \leq 12 \\
 & 3x_1 - 2x_2 \leq 8 \\
 & x_1, x_2 \geq 0
 \end{aligned}$$



Problemi LP con due variabili – Tipo B

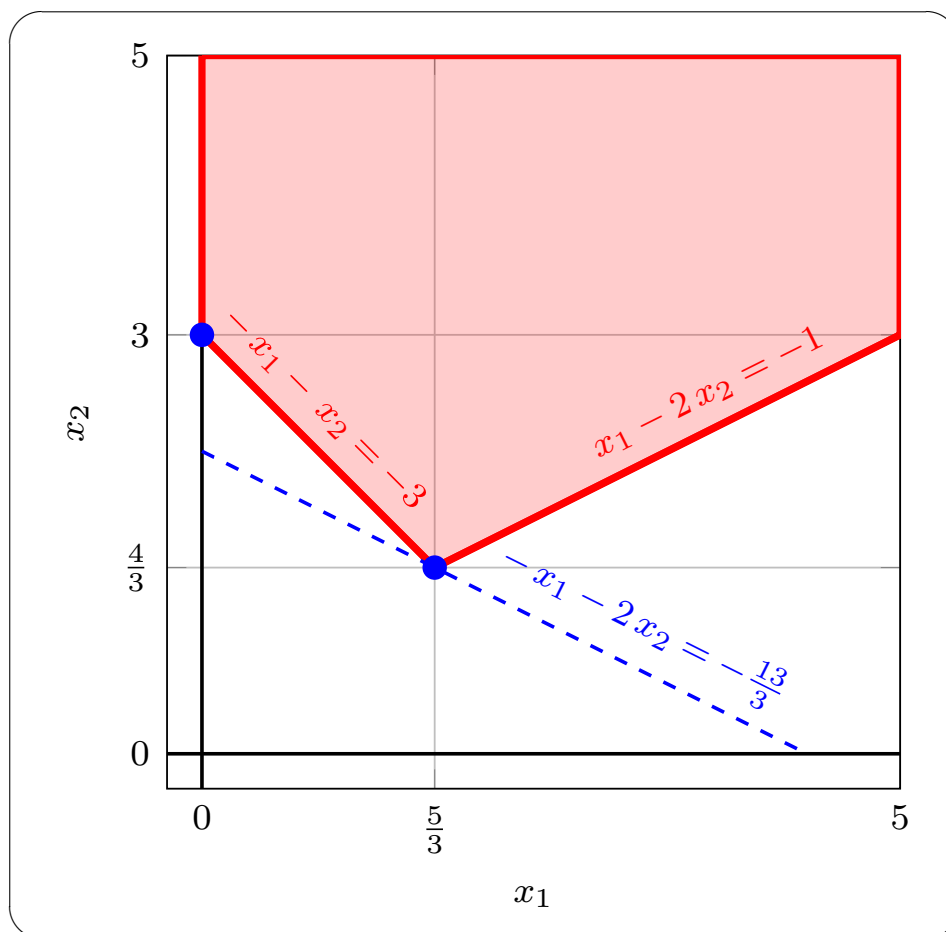
2.1 Problema LP P11

$$\begin{array}{llll} \max & -2x_1 & - & 4x_2 \\ \text{soggetto a} & -x_1 & - & x_2 \leq -2 \\ & x_1 & - & x_2 \leq 0 \\ & x_1, & & x_2 \geq 0 \end{array}$$



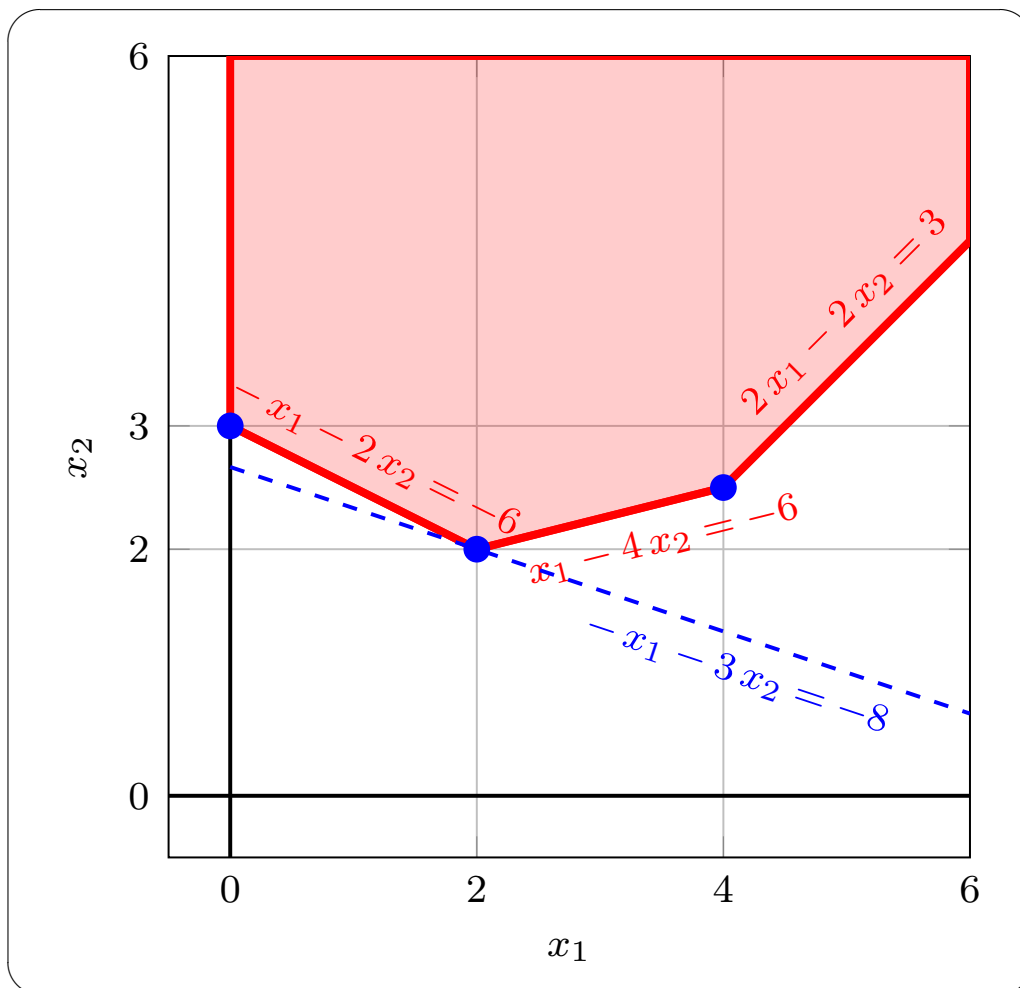
2.2 Problema LP P12

$$\begin{aligned} \max \quad & -x_1 - 2x_2 \\ \text{soggetto a} \quad & -x_1 - x_2 \leq -3 \\ & x_1 - 2x_2 \leq -1 \\ & x_1, x_2 \geq 0 \end{aligned}$$



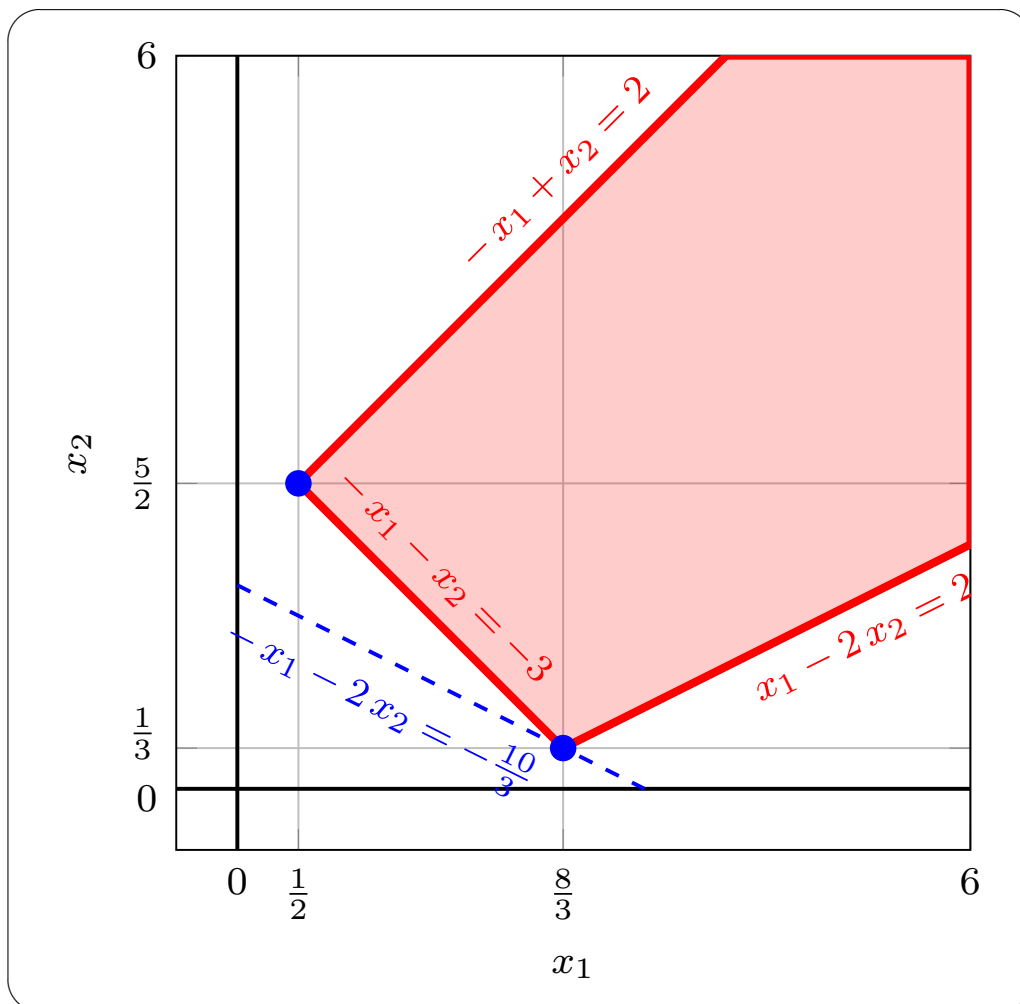
2.3 Problema LP P13

$$\begin{array}{ll}
 \max & -x_1 - 3x_2 \\
 \text{soggetto a} & -x_1 - 2x_2 \leq -6 \\
 & x_1 - 4x_2 \leq -6 \\
 & 2x_1 - 2x_2 \leq 3 \\
 & x_1, x_2 \geq 0
 \end{array}$$



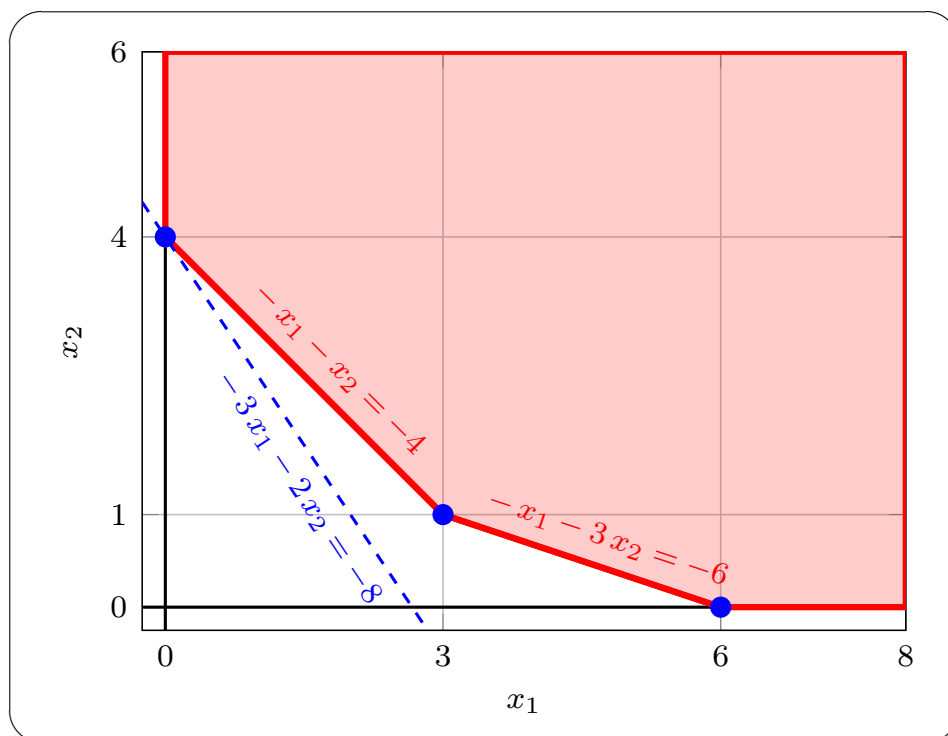
2.4 Problema LP P14

$$\begin{array}{ll}
 \max & -x_1 - 2x_2 \\
 \text{soggetto a} & -x_1 + x_2 \leq 2 \\
 & x_1 - 2x_2 \leq 2 \\
 & -x_1 - x_2 \leq -3 \\
 & x_1, x_2 \geq 0
 \end{array}$$



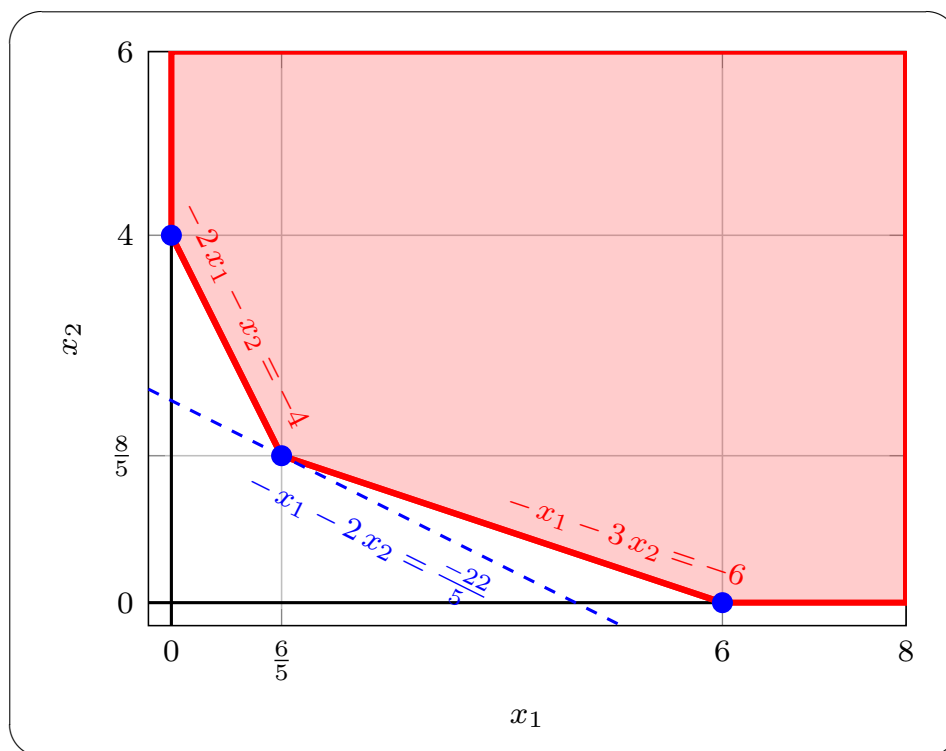
2.5 Problema LP P15

$$\begin{array}{llll} \max & -3x_1 & - & 2x_2 \\ \text{soggetto a} & -x_1 & - & x_2 \leq -4 \\ & -x_1 & - & 3x_2 \leq -6 \\ & x_1, & & x_2 \geq 0 \end{array}$$



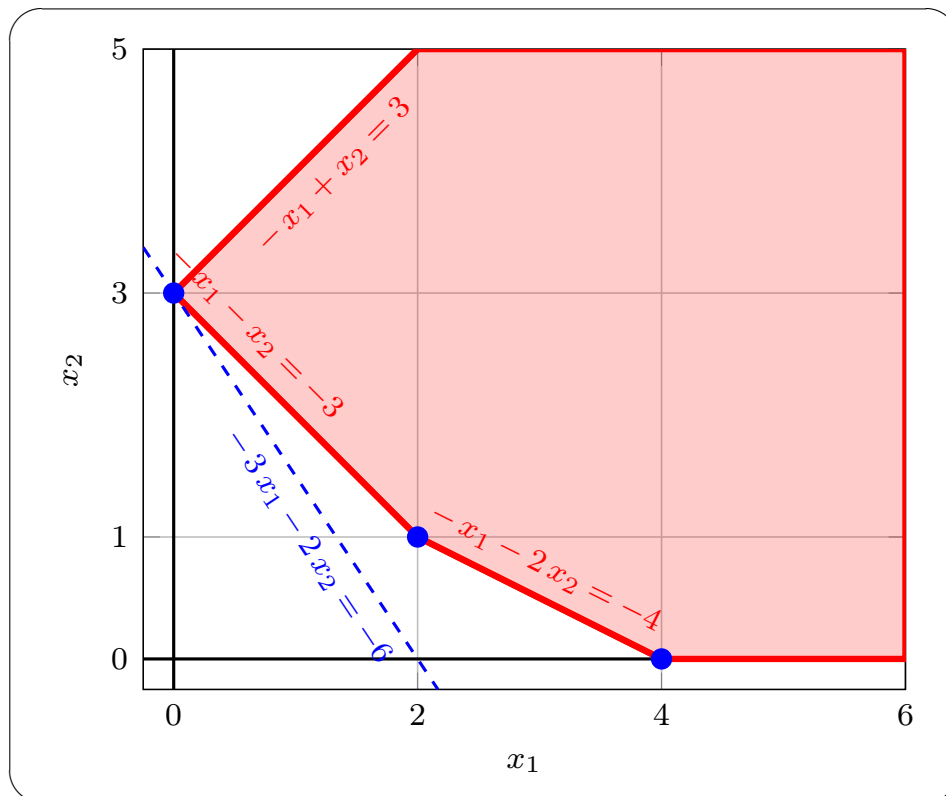
2.6 Problema LP P16

$$\begin{array}{llll} \max & -x_1 & - & 2x_2 \\ \text{soggetto a} & -2x_1 & - & x_2 \leq -4 \\ & -x_1 & - & 3x_2 \leq -6 \\ & x_1, & & x_2 \geq 0 \end{array}$$



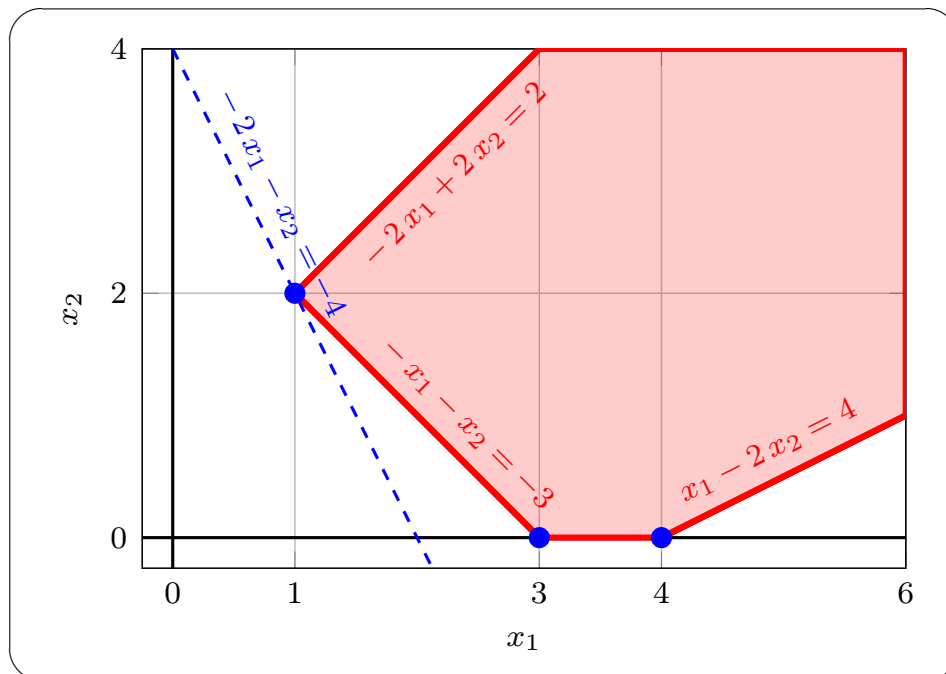
2.7 Problema LP P17

$$\begin{array}{llll}
 \max & -3x_1 & - & 2x_2 \\
 \text{soggetto a} & -x_1 & - & x_2 \leq -3 \\
 & -x_1 & + & x_2 \leq 3 \\
 & -x_1 & - & 2x_2 \leq -4 \\
 & x_1, & & x_2 \geq 0
 \end{array}$$



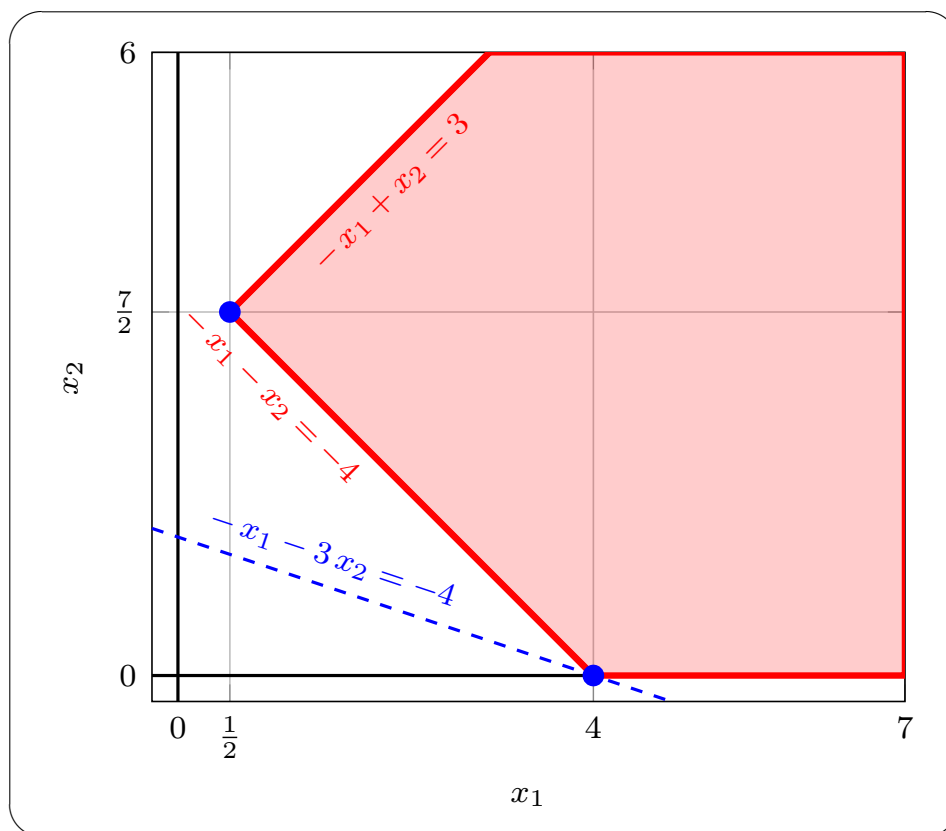
2.8 Problema LP P18

$$\begin{array}{llll}
 \max & -2x_1 & - & x_2 \\
 \text{soggetto a} & -x_1 & - & x_2 \leq -3 \\
 & x_1 & - & 2x_2 \leq 4 \\
 & -2x_1 & + & 2x_2 \leq 2 \\
 & x_1, & & x_2 \geq 0
 \end{array}$$



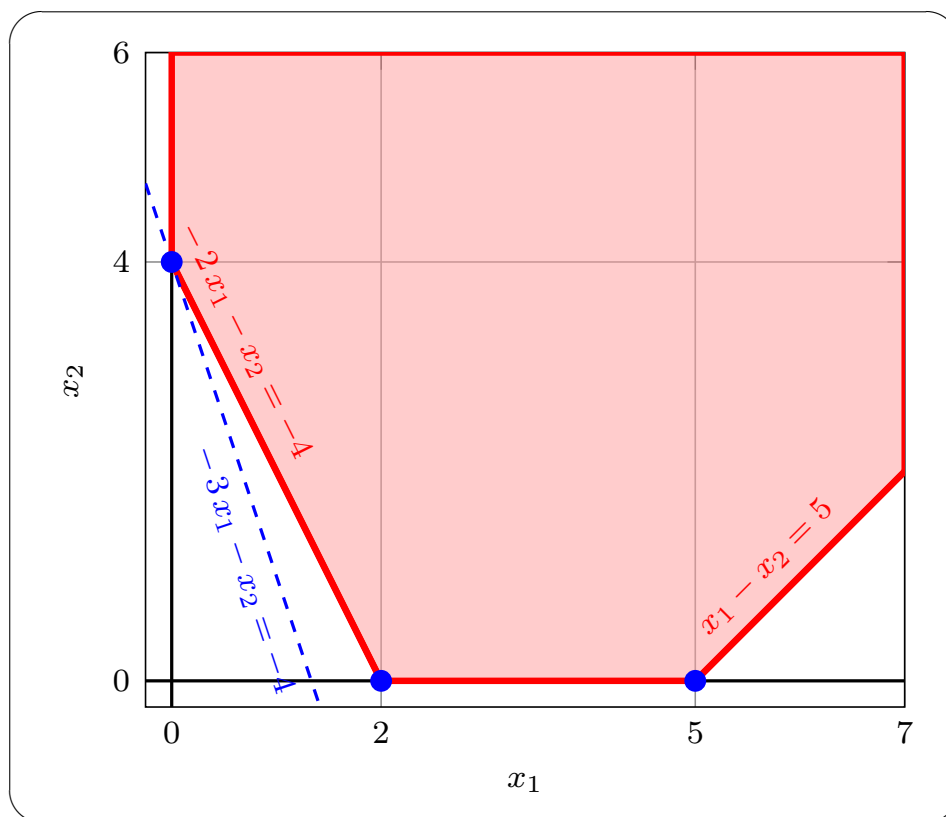
2.9 Problema LP P19

$$\begin{array}{llllll} \max & -x_1 & - & 3x_2 & & \\ \text{soggetto a} & -x_1 & - & x_2 & \leq & -4 \\ & -x_1 & + & x_2 & \leq & 3 \\ & x_1, & & x_2 & \geq & 0 \end{array}$$



2.10 Problema LP P20

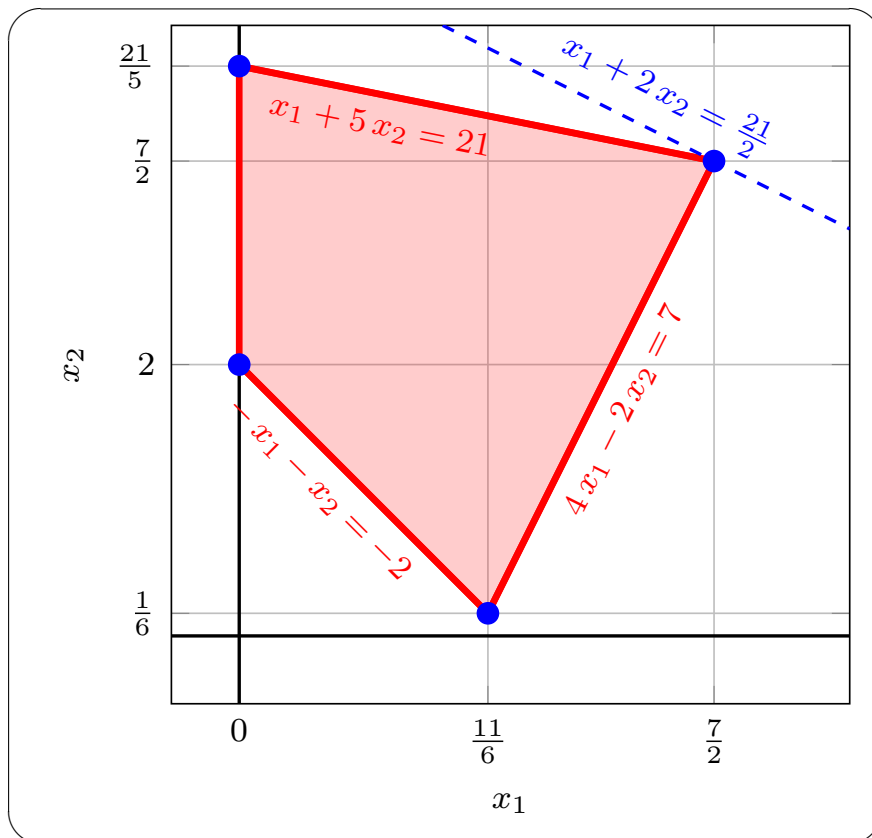
$$\begin{array}{llllll} \max & -3x_1 & - & x_2 & & \\ \text{soggetto a} & x_1 & - & x_2 & \leq & 5 \\ & -2x_1 & - & x_2 & \leq & -4 \\ & x_1, & & x_2 & \geq & 0 \end{array}$$



Problemi LP con due variabili – Tipo C

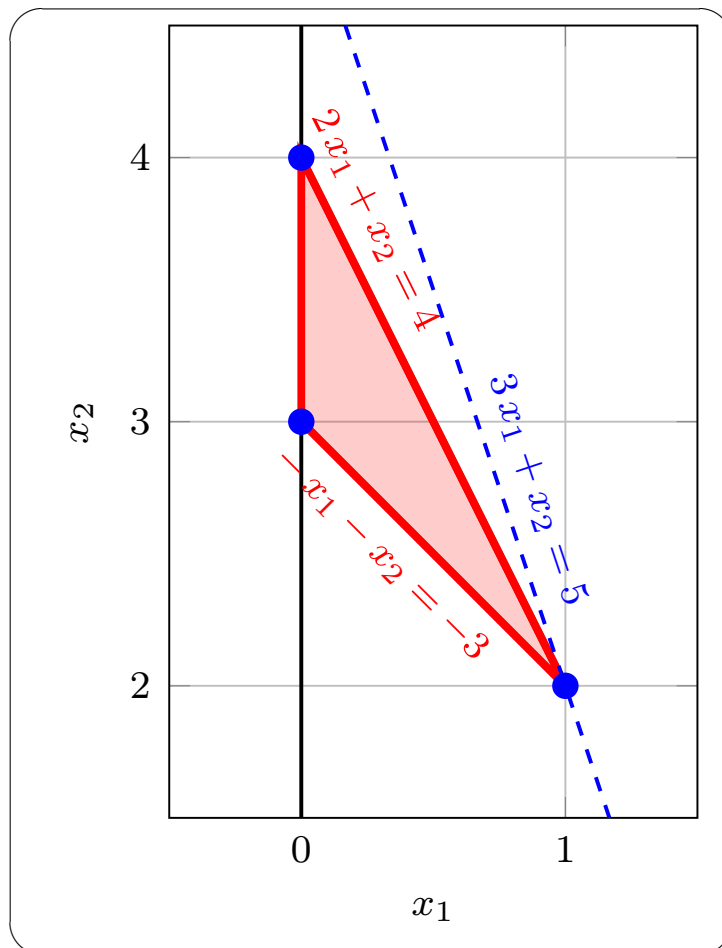
3.1 Problema LP P_{21}

$$\begin{aligned} \max \quad & x_1 + 2x_2 \\ \text{soggetto a} \quad & -x_1 - x_2 \leq -2 \\ & 4x_1 - 2x_2 \leq 7 \\ & x_1 + 5x_2 \leq 21 \\ & x_1, x_2 \geq 0 \end{aligned}$$



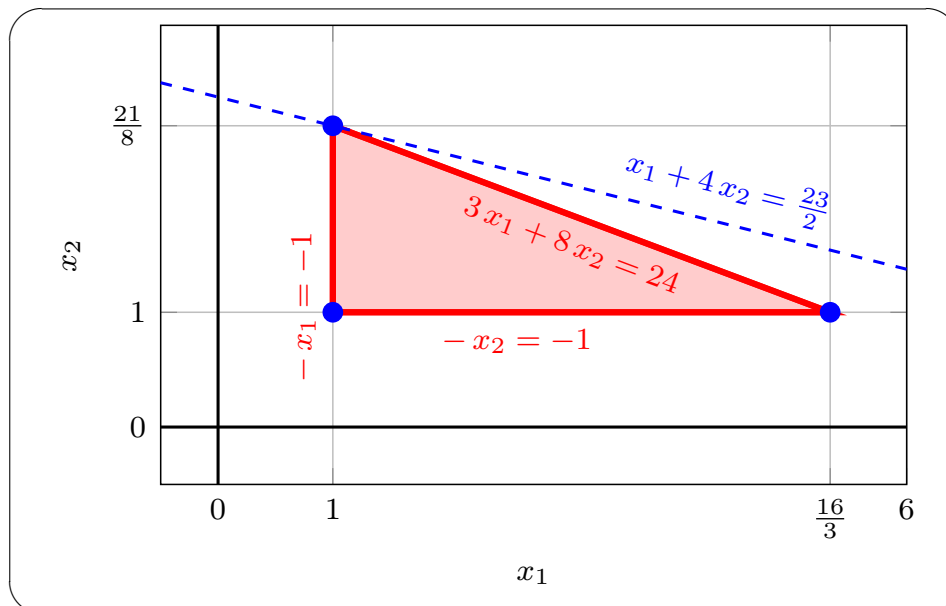
3.2 Problema LP P22

$$\begin{array}{ll}
 \max & 3x_1 + x_2 \\
 \text{soggetto a} & x_1 - x_2 \leq -1 \\
 & -x_1 - x_2 \leq -3 \\
 & 2x_1 + x_2 \leq 4 \\
 & x_1, x_2 \geq 0
 \end{array}$$



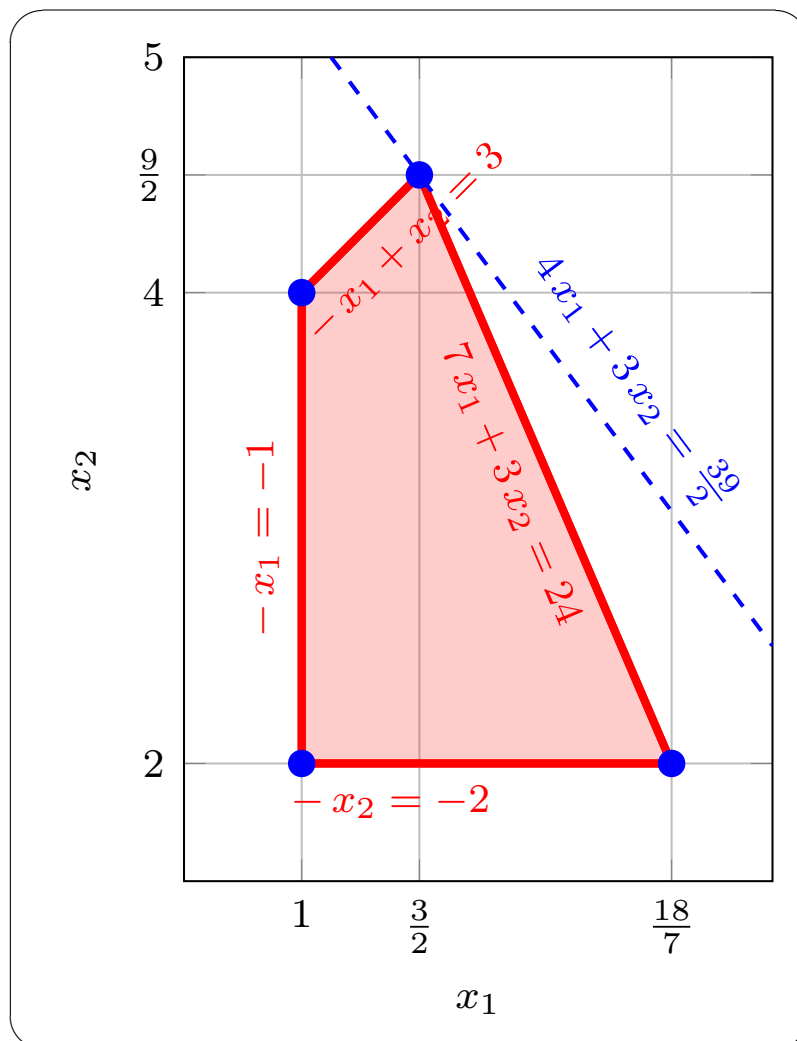
3.3 Problema LP $P23$

$$\begin{array}{llll}
 \max & x_1 & + & 4x_2 \\
 \text{soggetto a} & 3x_1 & + & 8x_2 \leq 24 \\
 & x_1 & & \geq 1 \\
 & & x_2 & \geq 1 \\
 & x_1, & x_2 & \geq 0
 \end{array}$$



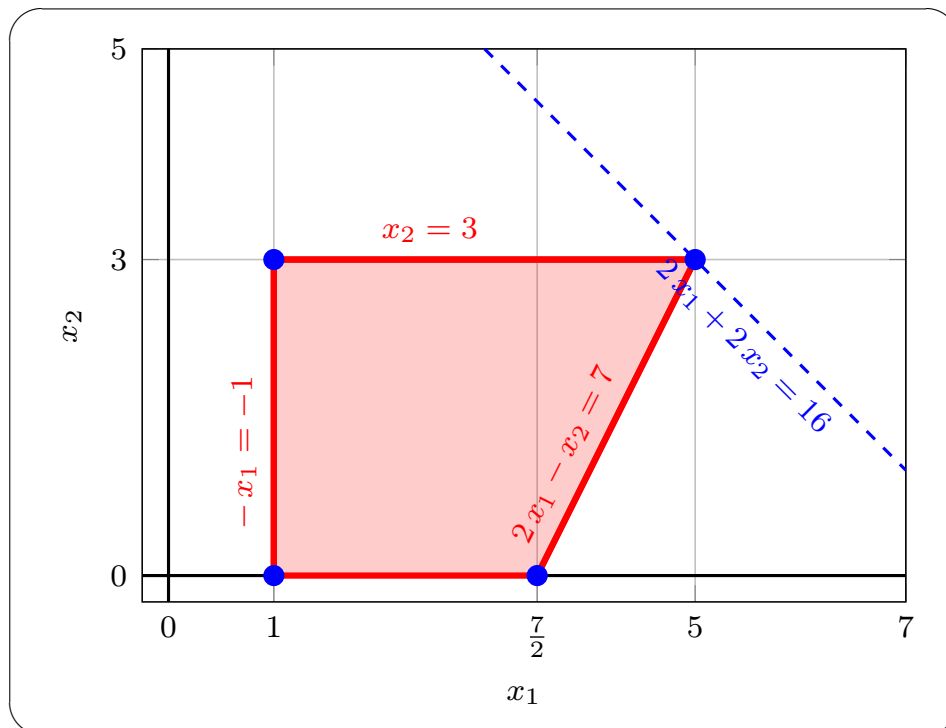
3.4 Problema LP P24

$$\begin{array}{llll}
 \max & 4x_1 & + & 3x_2 \\
 \text{soggetto a} & 7x_1 & + & 3x_2 \leq 24 \\
 & -x_1 & + & x_2 \leq 3 \\
 & x_1 & & \geq 1 \\
 & & & x_2 \geq 2 \\
 & x_1, & x_2 & \geq 0
 \end{array}$$



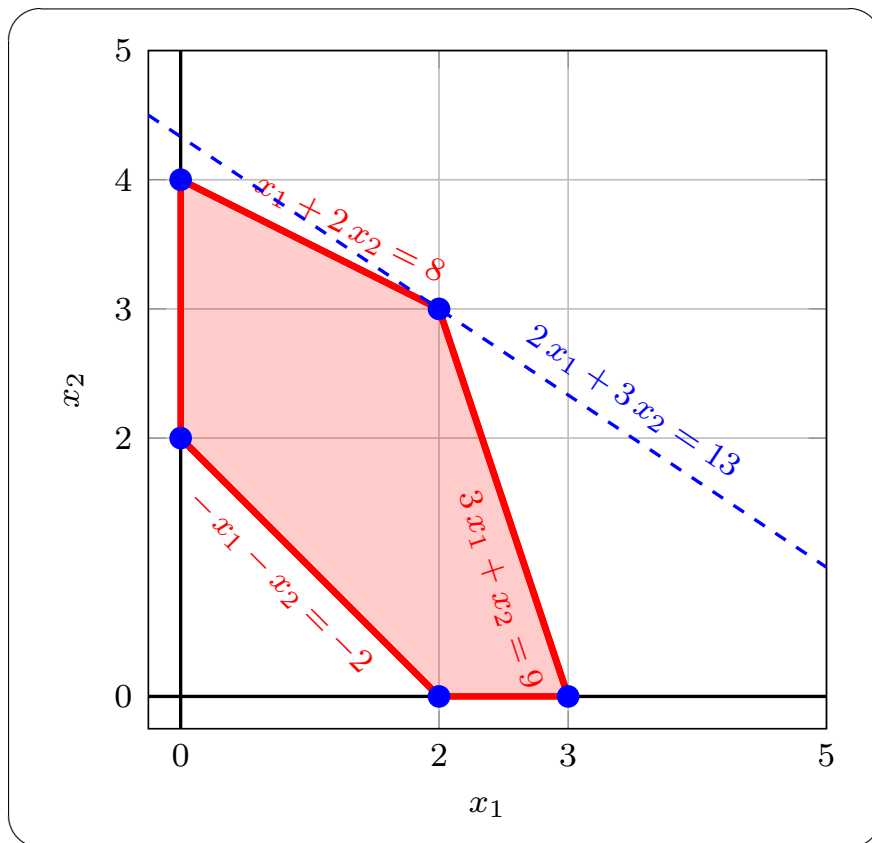
3.5 Problema LP P25

$$\begin{array}{llll}
 \max & 2x_1 & + & 2x_2 \\
 \text{soggetto a} & x_1 & & \geq 1 \\
 & & x_2 & \leq 3 \\
 & 2x_1 & - & x_2 \leq 7 \\
 & x_1, & x_2 & \geq 0
 \end{array}$$



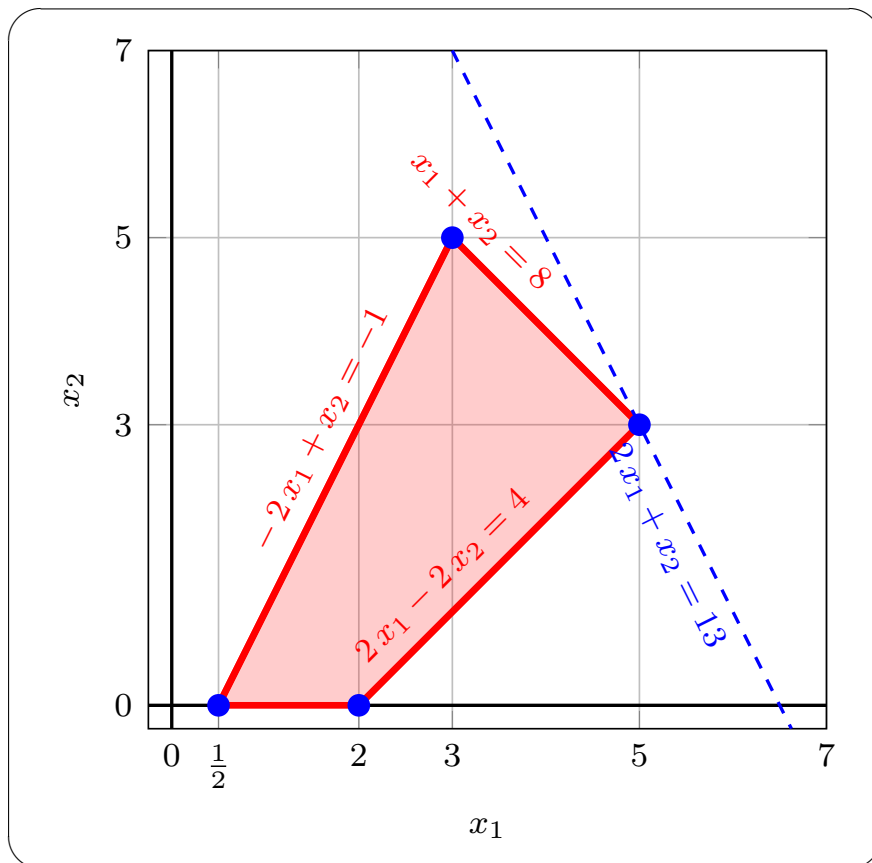
3.6 Problema LP P26

$$\begin{array}{llll}
 \max & 2x_1 & + & 3x_2 \\
 \text{soggetto a} & -x_1 & - & x_2 \leq -2 \\
 & x_1 & + & 2x_2 \leq 8 \\
 & 3x_1 & + & x_2 \leq 9 \\
 & x_1, & & x_2 \geq 0
 \end{array}$$



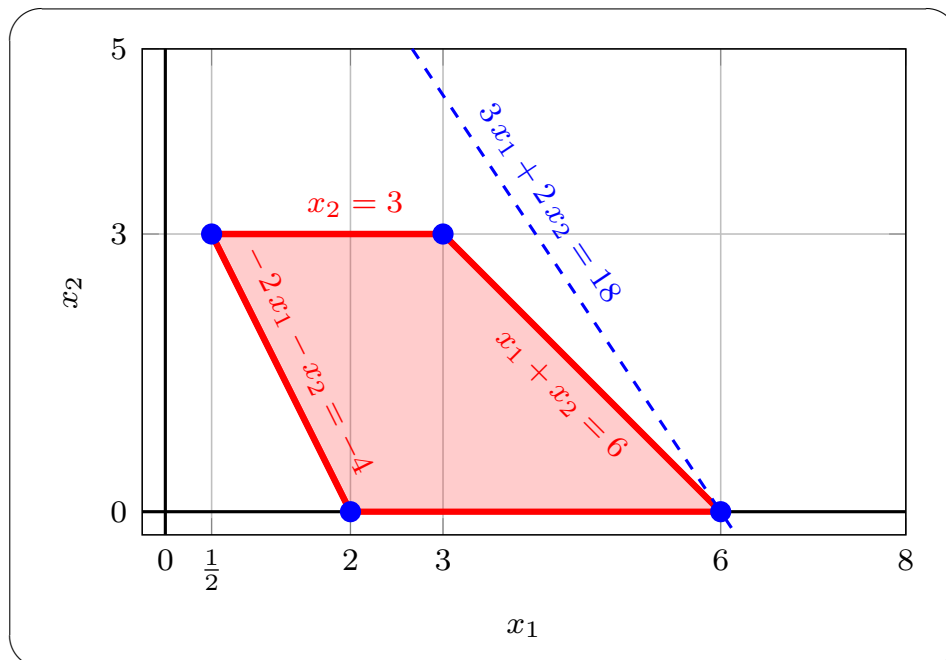
3.7 Problema LP P27

$$\begin{array}{llllll}
 \max & 2x_1 & + & x_2 & & \\
 \text{soggetto a} & x_1 & + & x_2 & \leq & 8 \\
 & 2x_1 & - & 2x_2 & \leq & 4 \\
 & -2x_1 & + & x_2 & \leq & -1 \\
 & x_1, & & x_2 & \geq & 0
 \end{array}$$



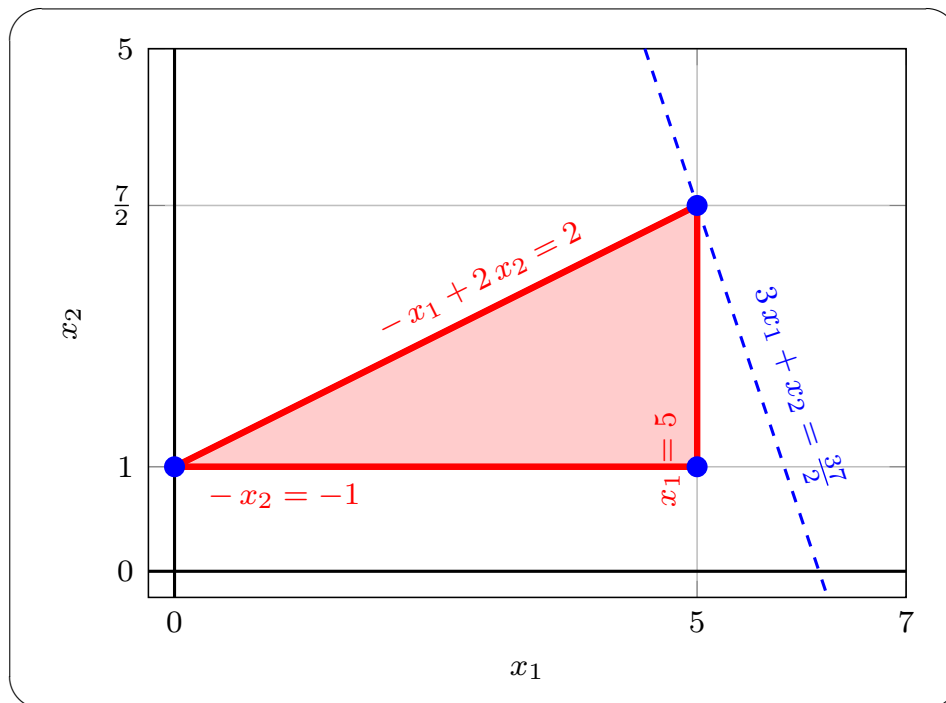
3.8 Problema LP P28

$$\begin{array}{llllll}
 \max & 3x_1 & + & 2x_2 & & \\
 \text{soggetto a} & x_1 & + & x_2 & \leq & 6 \\
 & -2x_1 & - & x_2 & \leq & -4 \\
 & & & x_2 & \leq & 3 \\
 & x_1, & & x_2 & \geq & 0
 \end{array}$$



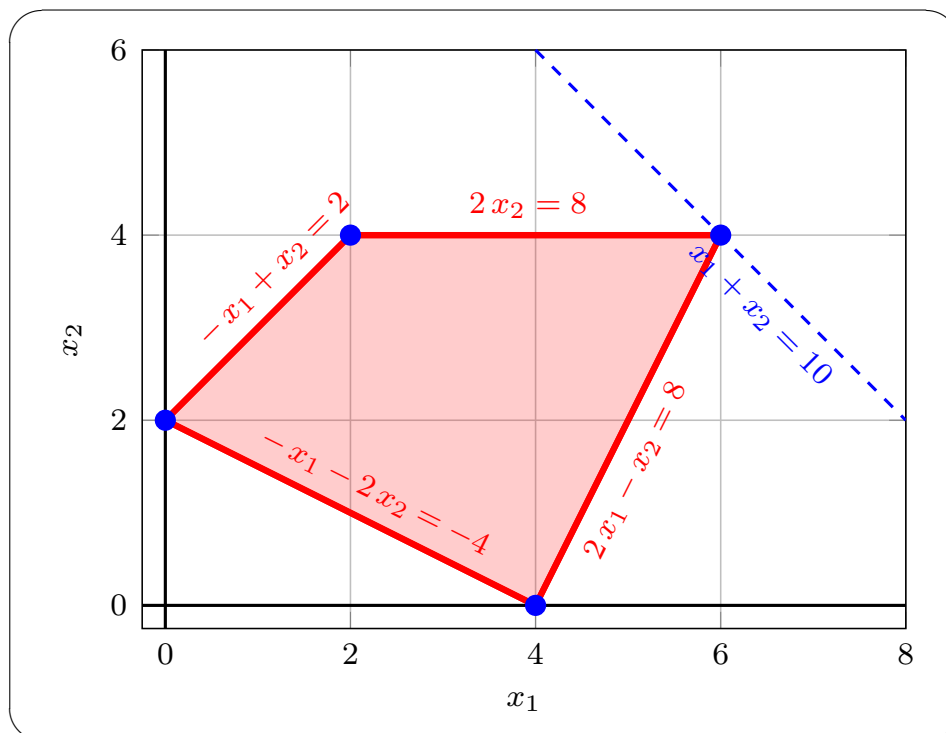
3.9 Problema LP P29

$$\begin{array}{ll}
 \max & 3x_1 + x_2 \\
 \text{soggetto a} & -x_1 + 2x_2 \leq 2 \\
 & x_2 \geq 1 \\
 & x_1 \leq 5 \\
 & x_1, x_2 \geq 0
 \end{array}$$



3.10 Problema LP P30

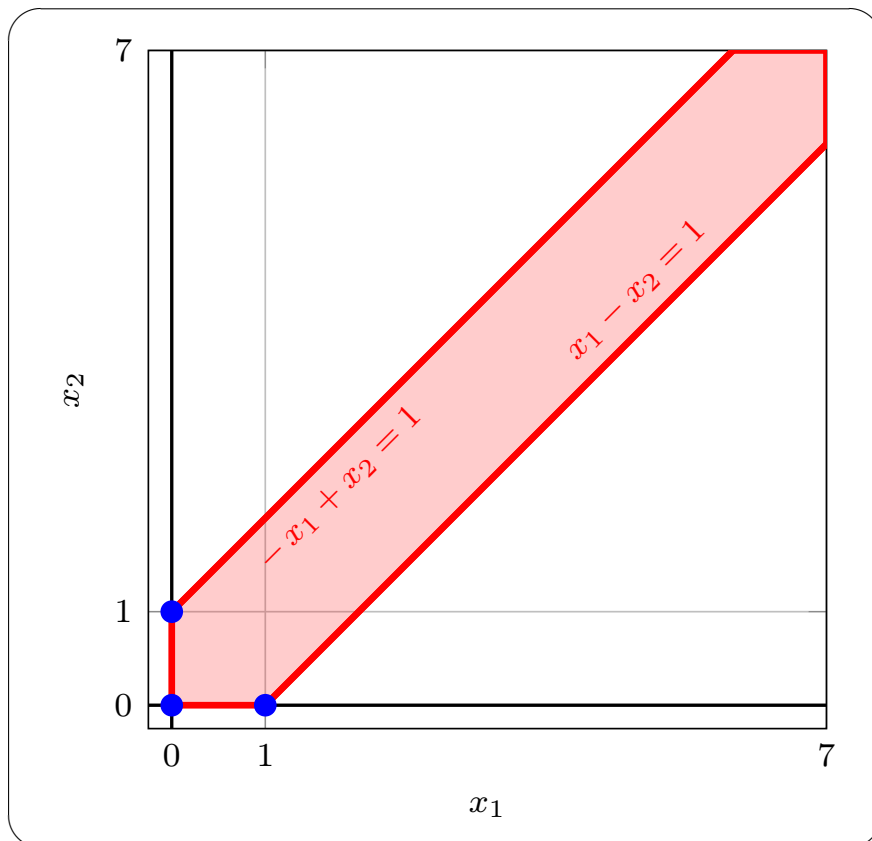
$$\begin{array}{llllll}
 \max & x_1 & + & x_2 & & \\
 \text{soggetto a} & -x_1 & + & x_2 & \leq & 2 \\
 & -x_1 & - & 2x_2 & \leq & -4 \\
 & 2x_1 & - & x_2 & \leq & 8 \\
 & & & 2x_2 & \leq & 8 \\
 & x_1, & & x_2 & \geq & 0
 \end{array}$$



Problemi LP con due variabili – Tipo D

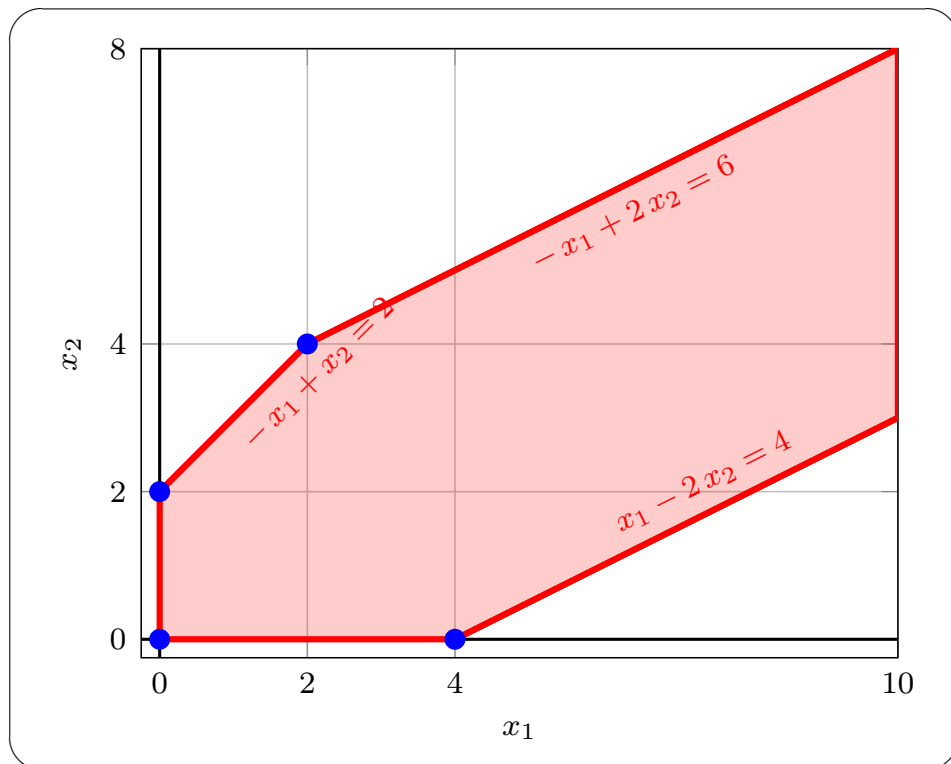
4.1 Problema LP P31

$$\begin{array}{llll} \max & x_1 & + & x_2 \\ \text{soggetto a} & -x_1 & + & x_2 \leq 1 \\ & x_1 & - & x_2 \leq 1 \\ & x_1, & & x_2 \geq 0 \end{array}$$



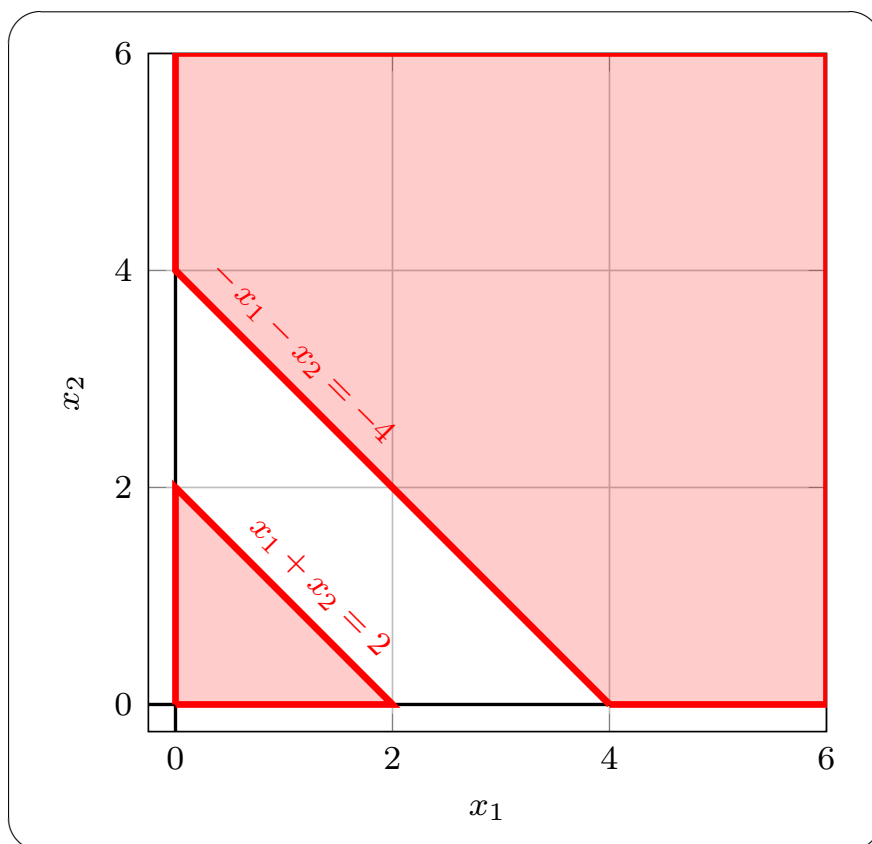
4.2 Problema LP P32

$$\begin{array}{llll}
 \max & 2x_1 & + & x_2 \\
 \text{soggetto a} & -x_1 & + & x_2 \leq 2 \\
 & -x_1 & + & 2x_2 \leq 6 \\
 & x_1 & - & 2x_2 \leq 4 \\
 & x_1, & & x_2 \geq 0
 \end{array}$$



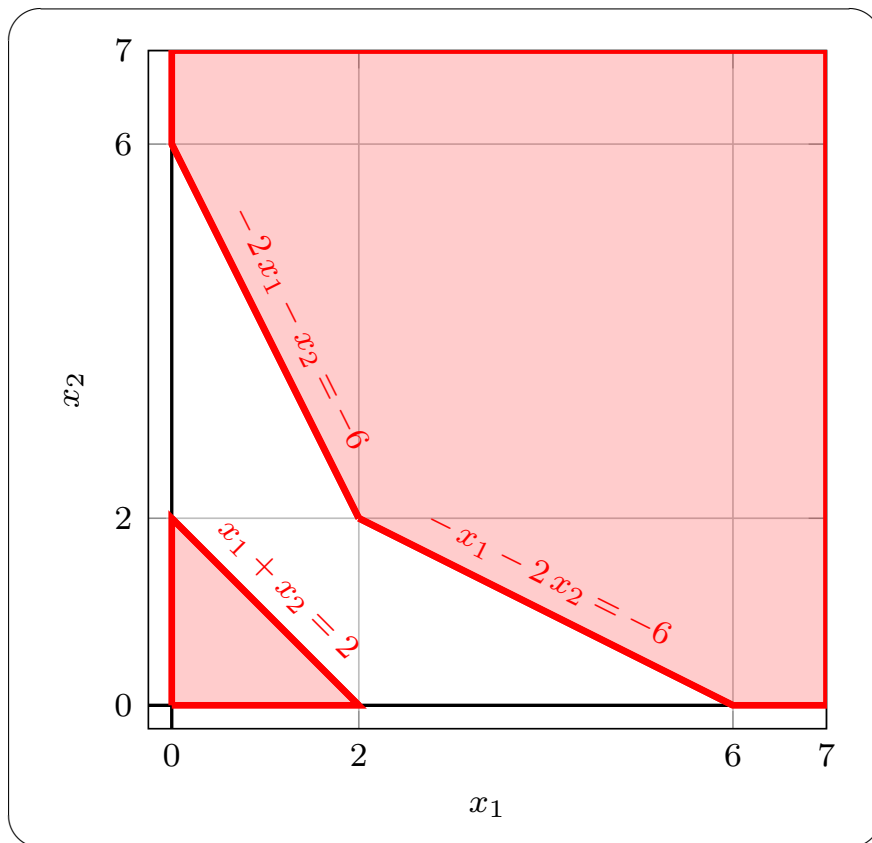
4.3 Problema LP P33

$$\begin{array}{llll}
 \max & x_1 & + & x_2 \\
 \text{soggetto a} & x_1 & + & x_2 \leq 2 \\
 & -x_1 & - & x_2 \leq -4 \\
 & x_1, & & x_2 \geq 0
 \end{array}$$



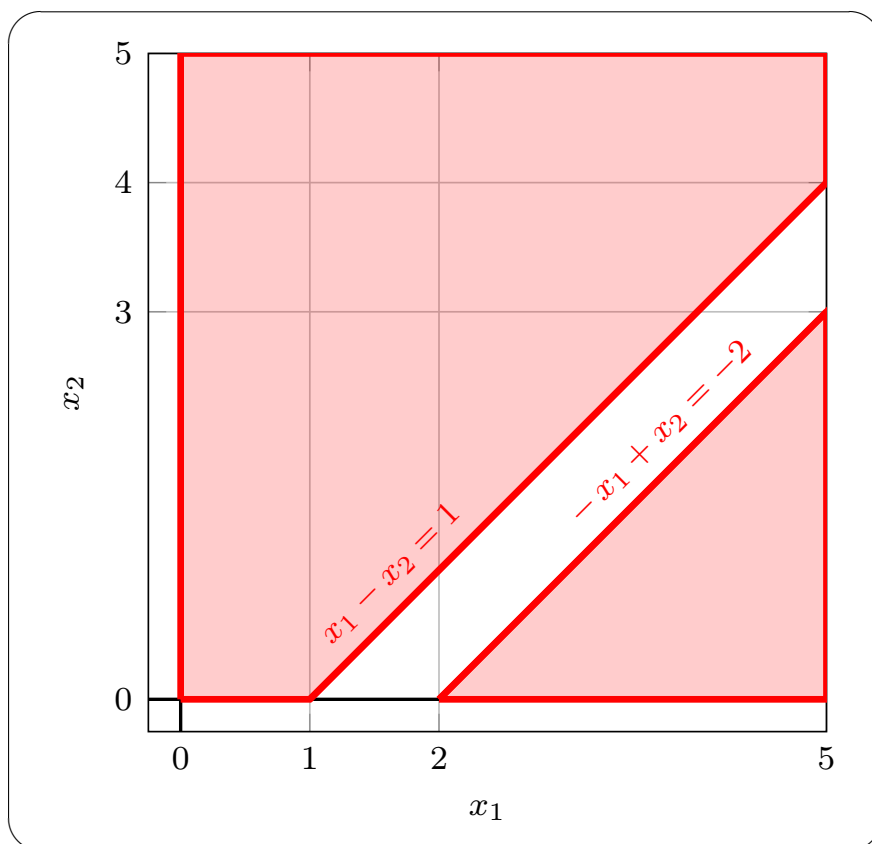
4.4 Problema LP P34

$$\begin{array}{llllll} \max & -2x_1 & - & x_2 & & \\ \text{soggetto a} & -x_1 & - & 2x_2 & \leq & -6 \\ & -2x_1 & - & x_2 & \leq & -6 \\ & x_1 & + & x_2 & \leq & 2 \\ & x_1, & & x_2 & \geq & 0 \end{array}$$



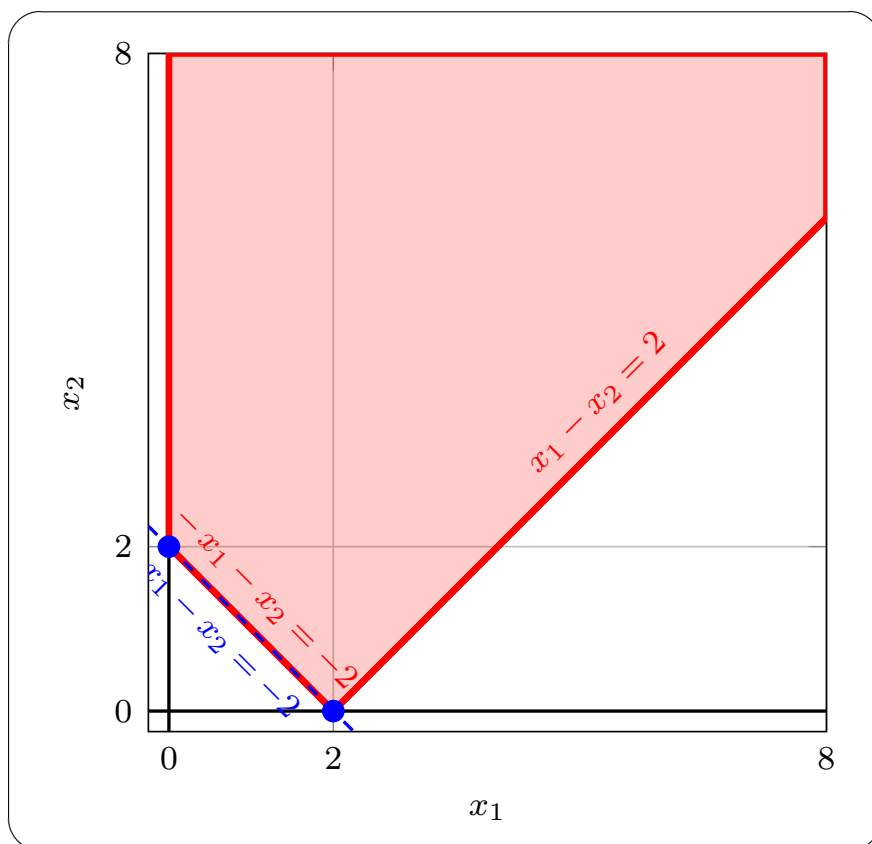
4.5 Problema LP P35

$$\begin{array}{llll}
 \max & x_1 & + & x_2 \\
 \text{soggetto a} & x_1 & - & x_2 \leq 1 \\
 & -x_1 & + & x_2 \leq -2 \\
 & x_1, & & x_2 \geq 0
 \end{array}$$



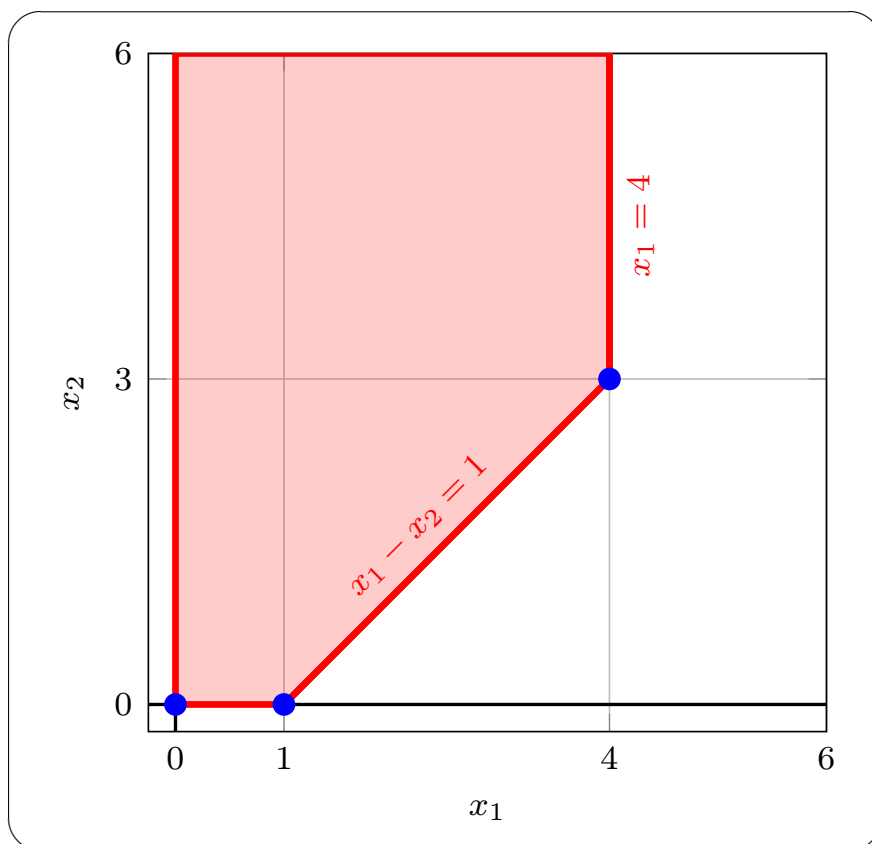
4.6 Problema LP P36

$$\begin{array}{llllll} \max & -x_1 & - & x_2 & & \\ \text{soggetto a} & -x_1 & - & x_2 & \leq & -2 \\ & x_1 & - & x_2 & \leq & 2 \\ & x_1, & & x_2 & \geq & 0 \end{array}$$



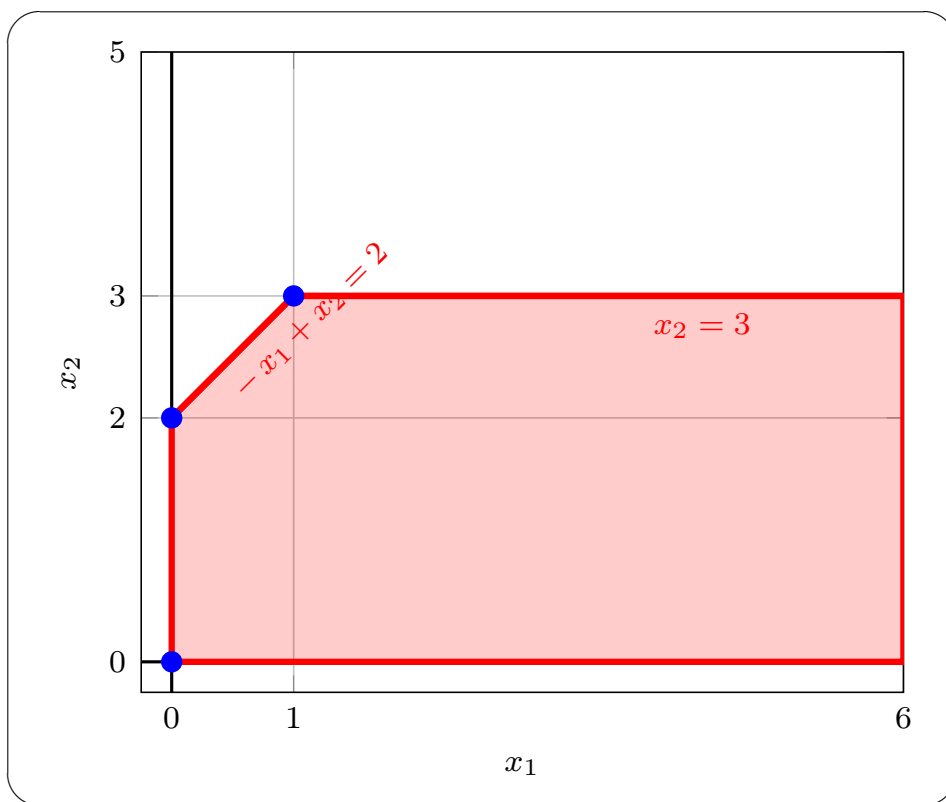
4.7 Problema LP *P37*

$$\begin{array}{llll} \max & x_1 & + & 2x_2 \\ \text{soggetto a} & x_1 & - & x_2 \leq 1 \\ & x_1 & & \leq 4 \\ & x_1, & x_2 & \geq 0 \end{array}$$



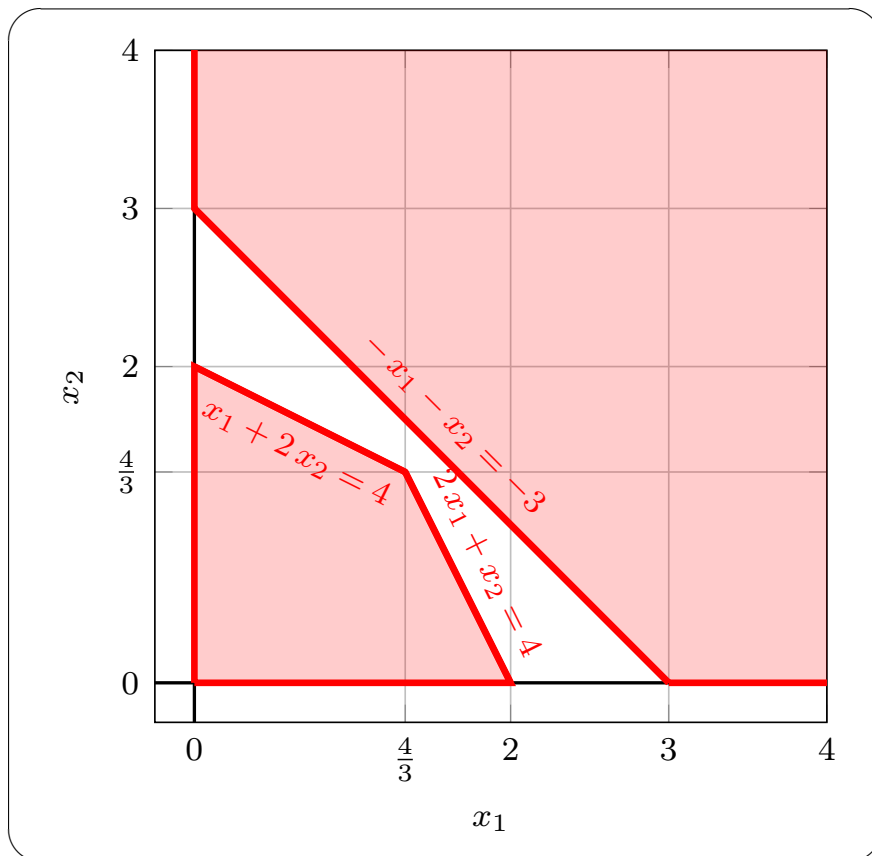
4.8 Problema LP P38

$$\begin{aligned} \max \quad & 2x_1 + x_2 \\ \text{soggetto a} \quad & -x_1 + x_2 \leq 2 \\ & x_2 \leq 3 \\ & x_1, x_2 \geq 0 \end{aligned}$$



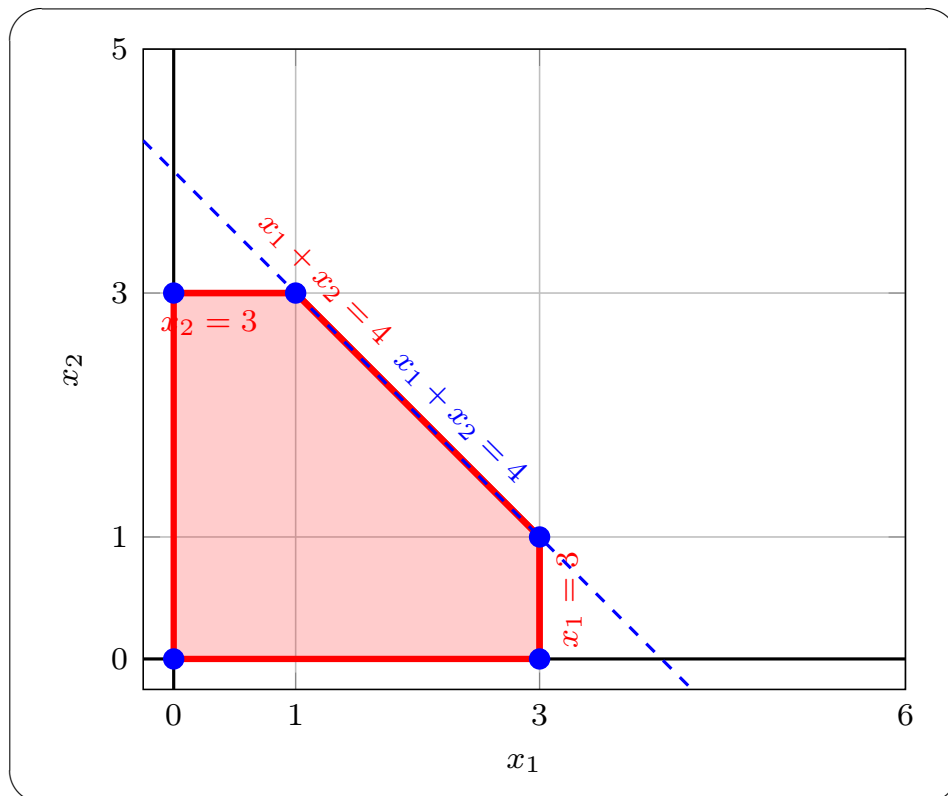
4.9 Problema LP P39

$$\begin{array}{llllll}
 \max & x_1 & + & x_2 & & \\
 \text{soggetto a} & 2x_1 & + & x_2 & \leq & 4 \\
 & x_1 & + & 2x_2 & \leq & 4 \\
 & -x_1 & - & x_2 & \leq & -3 \\
 & x_1, & & x_2 & \geq & 0
 \end{array}$$



4.10 Problema LP P40

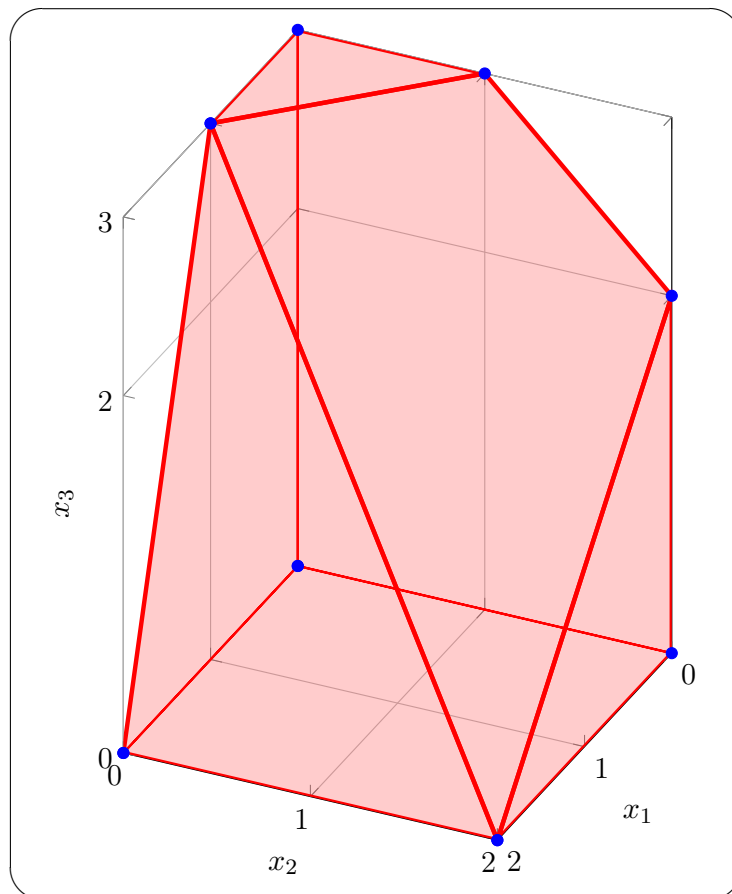
$$\begin{array}{llll}
 \max & x_1 & + & x_2 \\
 \text{soggetto a} & x_1 & + & x_2 \leq 4 \\
 & x_1 & & \leq 3 \\
 & & x_2 & \leq 3 \\
 & x_1, & x_2 & \geq 0
 \end{array}$$



Problemi LP con tre variabili – Tipo A

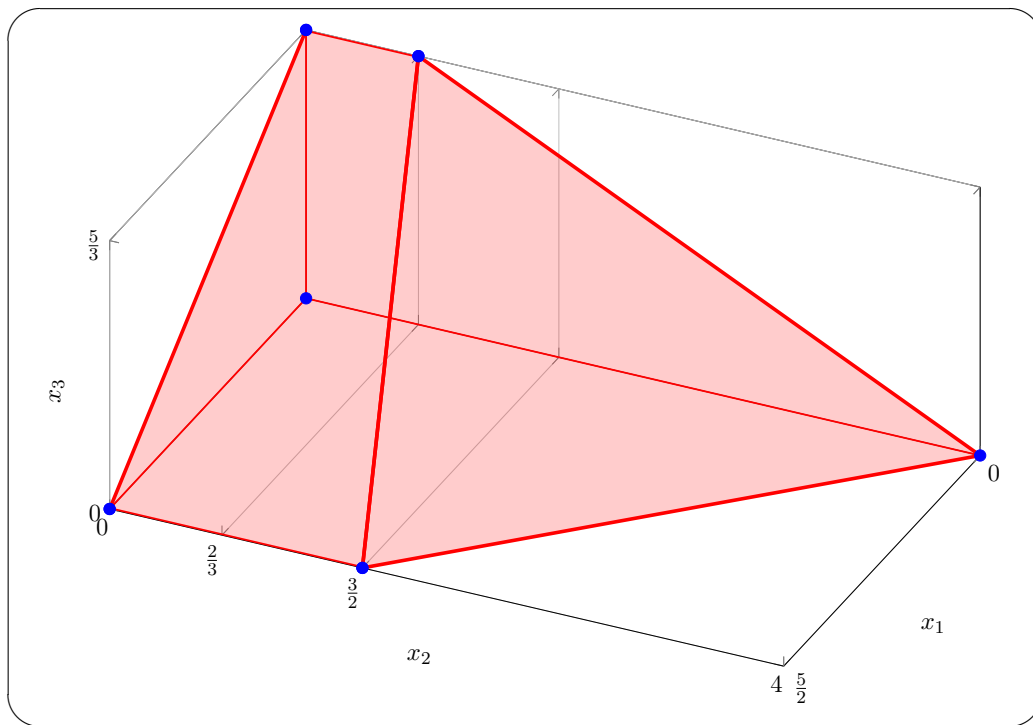
5.1 Problema LP P_{41}

$$\begin{array}{llllll}
 \max & 2x_1 & + & x_2 & + & 3x_3 \\
 \text{soggetto a} & x_1 & + & x_2 & + & x_3 \leq 4 \\
 & & & x_2 & & \leq 2 \\
 & & & & & x_3 \leq 3 \\
 & 3x_1 & & & + & x_3 \leq 6 \\
 & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



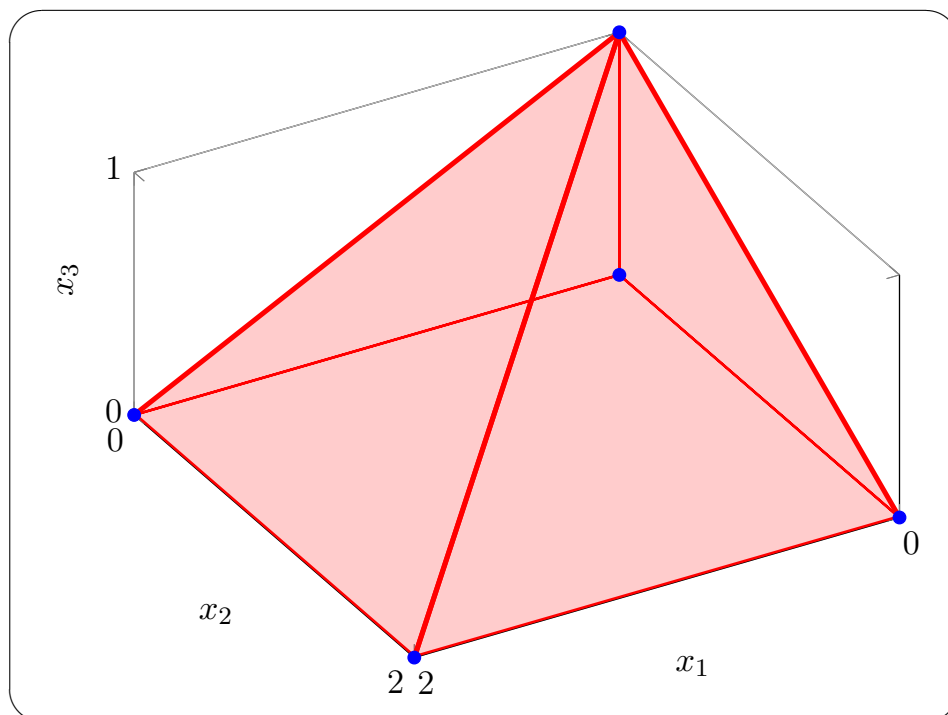
5.2 Problema LP $P42$

$$\begin{aligned}
 &\max \quad 3x_1 + 2x_2 + 4x_3 \\
 &\text{soggetto a} \quad x_1 + x_2 + 2x_3 \leq 4 \\
 &\quad \quad \quad 2x_1 + 3x_3 \leq 5 \\
 &\quad \quad \quad 2x_1 + x_2 + 3x_3 \leq 7 \\
 &\quad \quad \quad x_1, x_2, x_3 \geq 0
 \end{aligned}$$



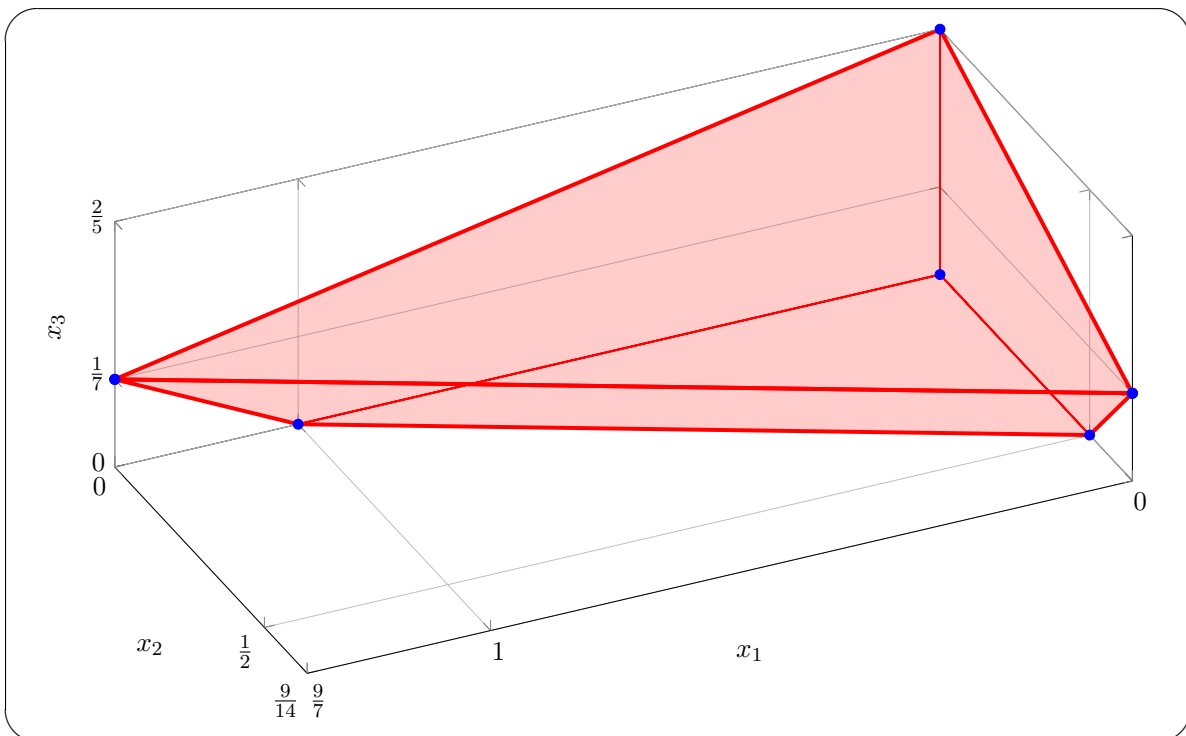
5.3 Problema LP P43

$$\begin{array}{ll}
 \max & x_1 + 2x_2 + 7x_3 \\
 \text{soggetto a} & x_1 + 2x_3 \leq 2 \\
 & x_2 + 2x_3 \leq 2 \\
 & x_1, x_2, x_3 \geq 0
 \end{array}$$



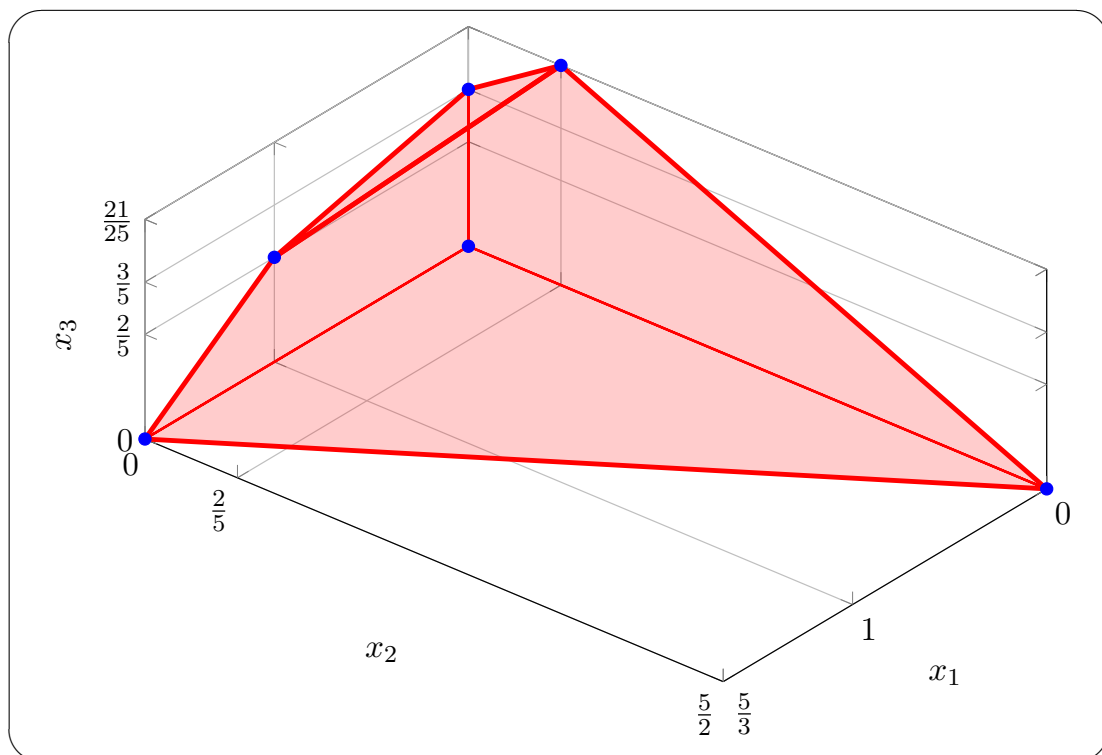
5.4 Problema LP P44

$$\begin{array}{ll}
 \max & x_1 + 2x_2 + 3x_3 \\
 \text{soggetto a} & x_1 + 2x_2 - 2x_3 \leq 1 \\
 & 2x_1 - x_2 - 3x_3 \leq 4 \\
 & x_1 + 2x_2 + 5x_3 \leq 2 \\
 & x_1, x_2, x_3 \geq 0
 \end{array}$$



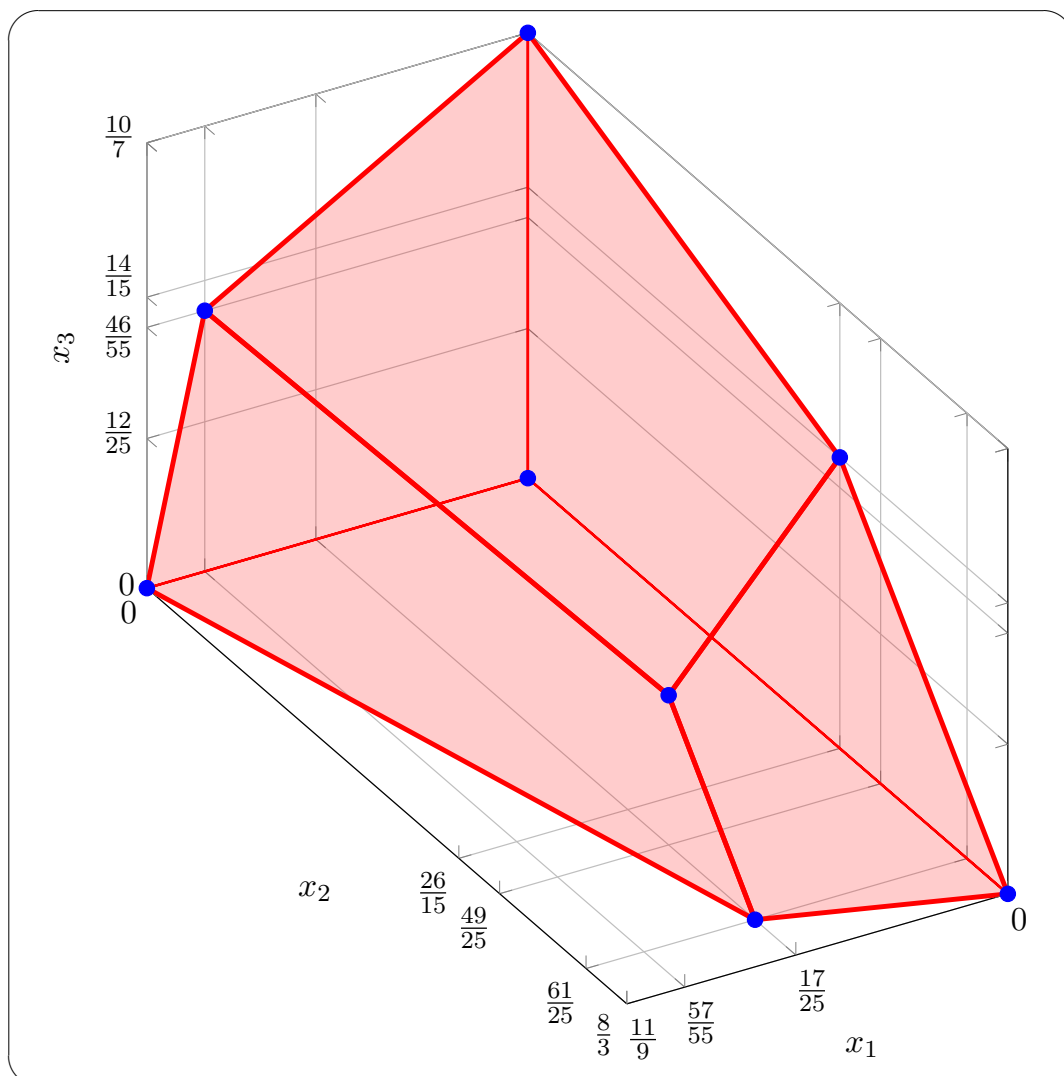
5.5 Problema LP P45

$$\begin{aligned}
 &\max \quad 4x_1 - 13x_2 + 7x_3 \\
 &\text{sogetto a} \quad 3x_1 + 2x_2 + 5x_3 \leq 5 \\
 &\quad \quad \quad x_1 - 3x_2 + 5x_3 \leq 3 \\
 &\quad \quad \quad x_1, \quad x_2, \quad x_3 \geq 0
 \end{aligned}$$



5.6 Problema LP P46

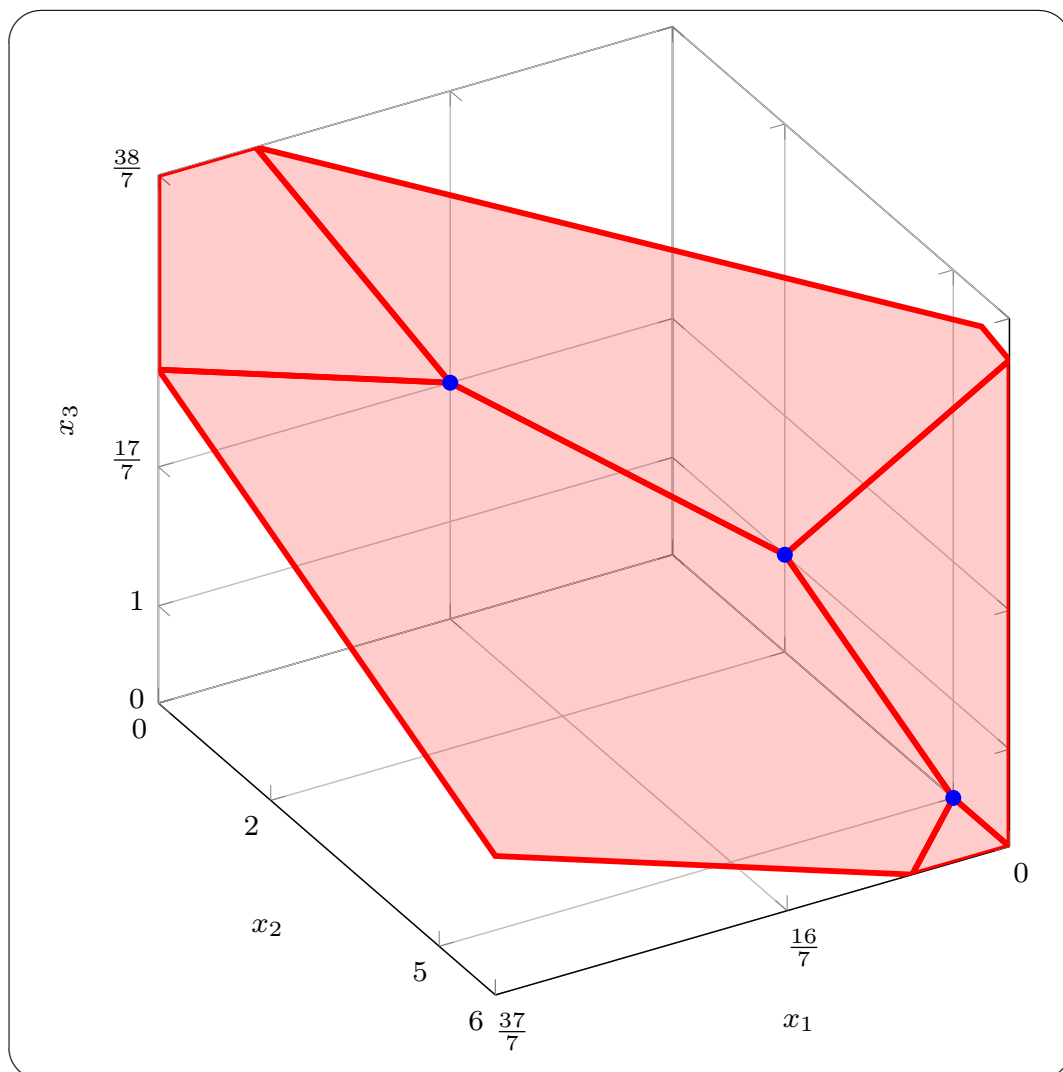
$$\begin{aligned}
 &\max \quad 5x_1 + 6x_2 + 10x_3 \\
 &\text{soggetto a} \quad 9x_1 + 2x_2 + 2x_3 \leq 11 \\
 &\quad \quad \quad 2x_1 + 6x_2 + 6x_3 \leq 16 \\
 &\quad \quad \quad 4x_1 + 2x_2 + 7x_3 \leq 10 \\
 &\quad \quad \quad x_1, \quad x_2, \quad x_3 \geq 0
 \end{aligned}$$



Problemi LP con tre variabili – Tipo B

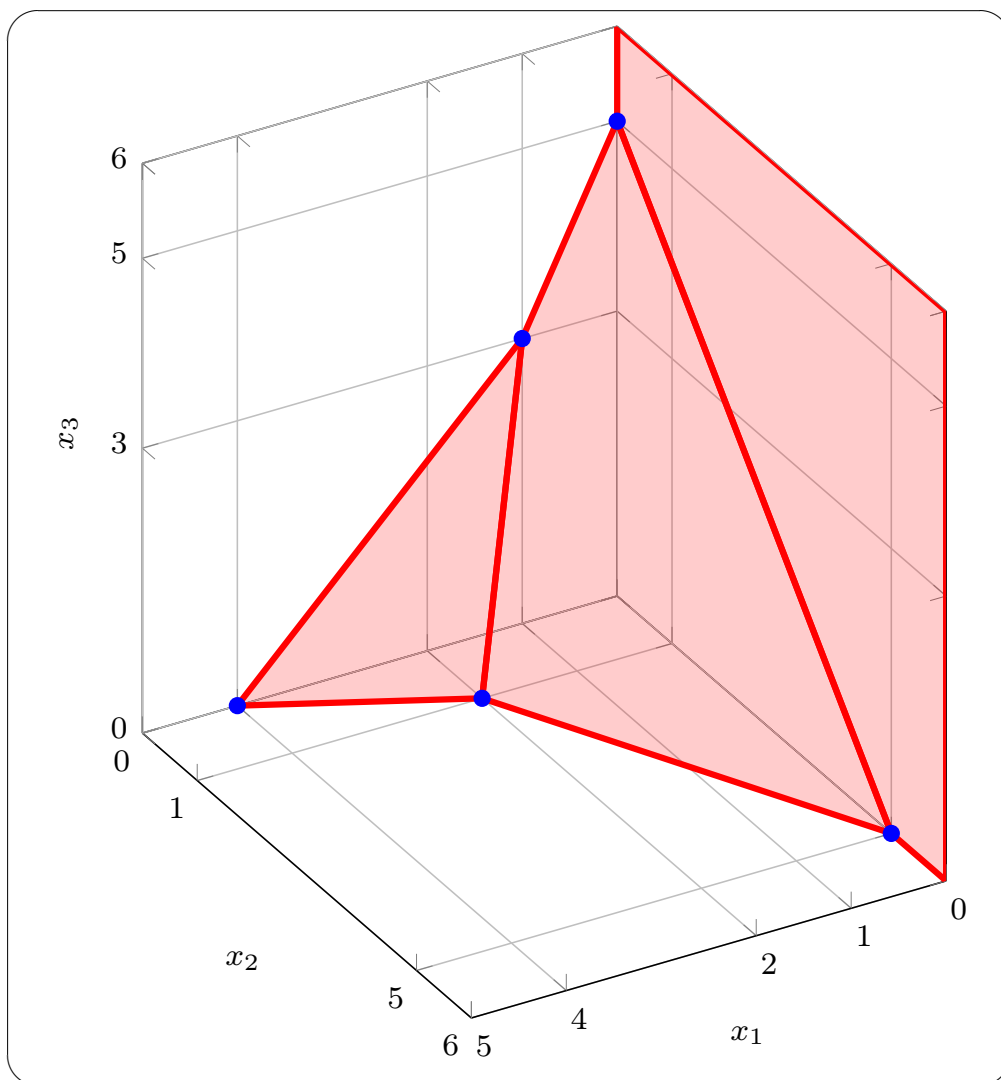
6.1 Problema LP P51

$$\begin{array}{llllll}
 \max & - & 2x_1 & - & x_2 & \\
 \text{soggetto a} & & x_1 & - & x_2 & - 3x_3 \leq -5 \\
 & & -3x_1 & - & 2x_2 & + 2x_3 \leq -2 \\
 & & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



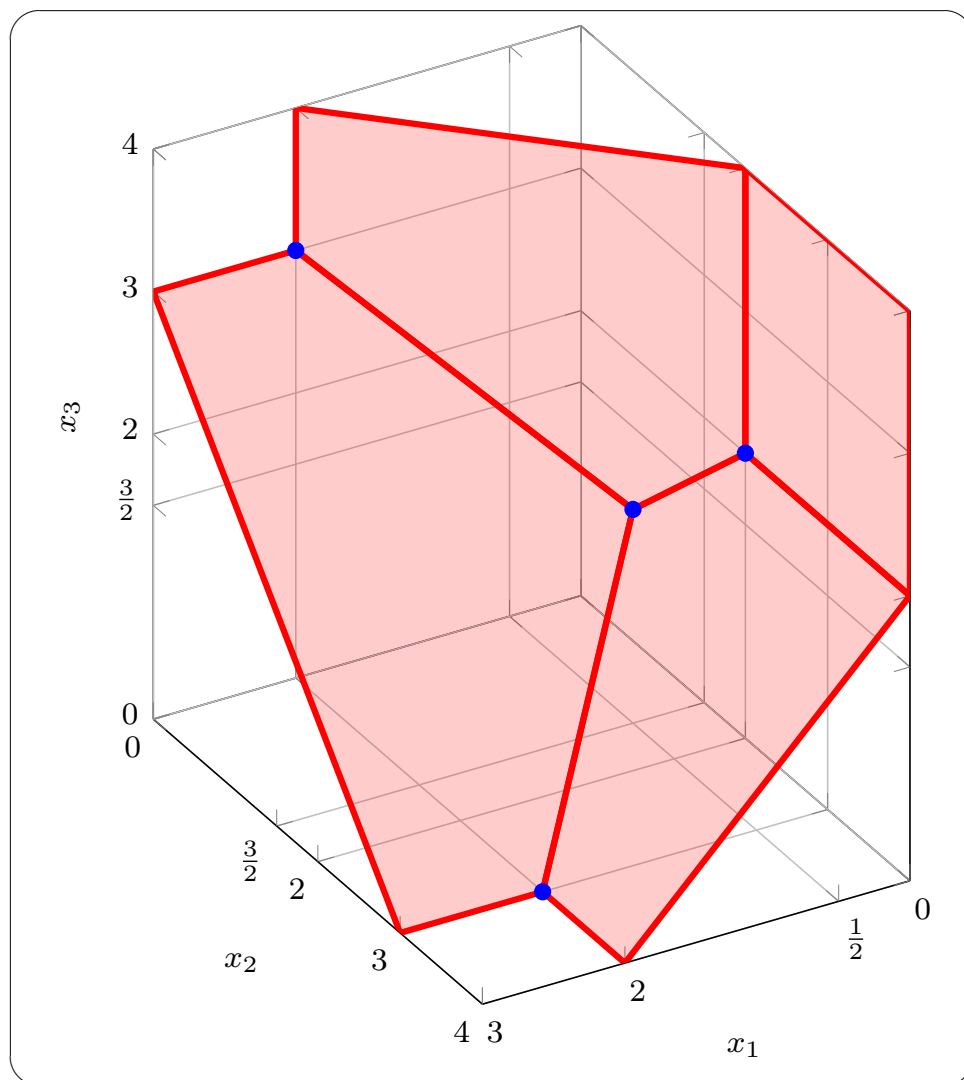
6.2 Problema LP P52

$$\begin{array}{llllll}
 \max & - & x_1 & - & 2x_2 & - & x_3 \\
 \text{soggetto a} & - & 2x_1 & - & x_2 & - & x_3 \leq -5 \\
 & - & x_1 & - & 2x_2 & - & x_3 \leq -4 \\
 & - & x_1 & - & x_2 & - & 2x_3 \leq -3 \\
 & & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



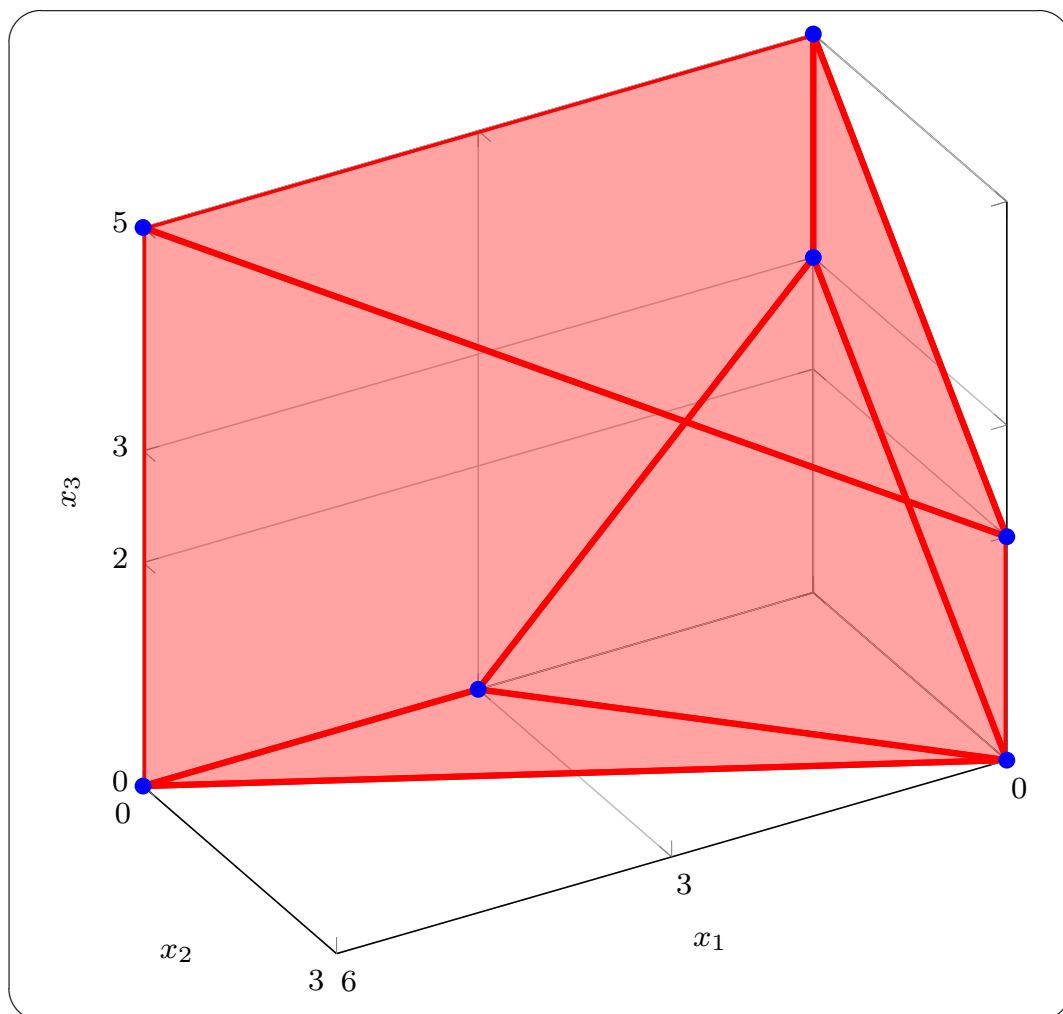
6.3 Problema LP $P53$

$$\begin{array}{llll}
 \max & - & x_1 & - & 2x_2 & - & 4x_3 \\
 \text{soggetto a} & - & x_1 & - & x_2 & & \leq -2 \\
 & & & - & x_2 & - & x_3 \leq -3 \\
 & - & x_1 & & & - & x_3 \leq -2 \\
 & & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



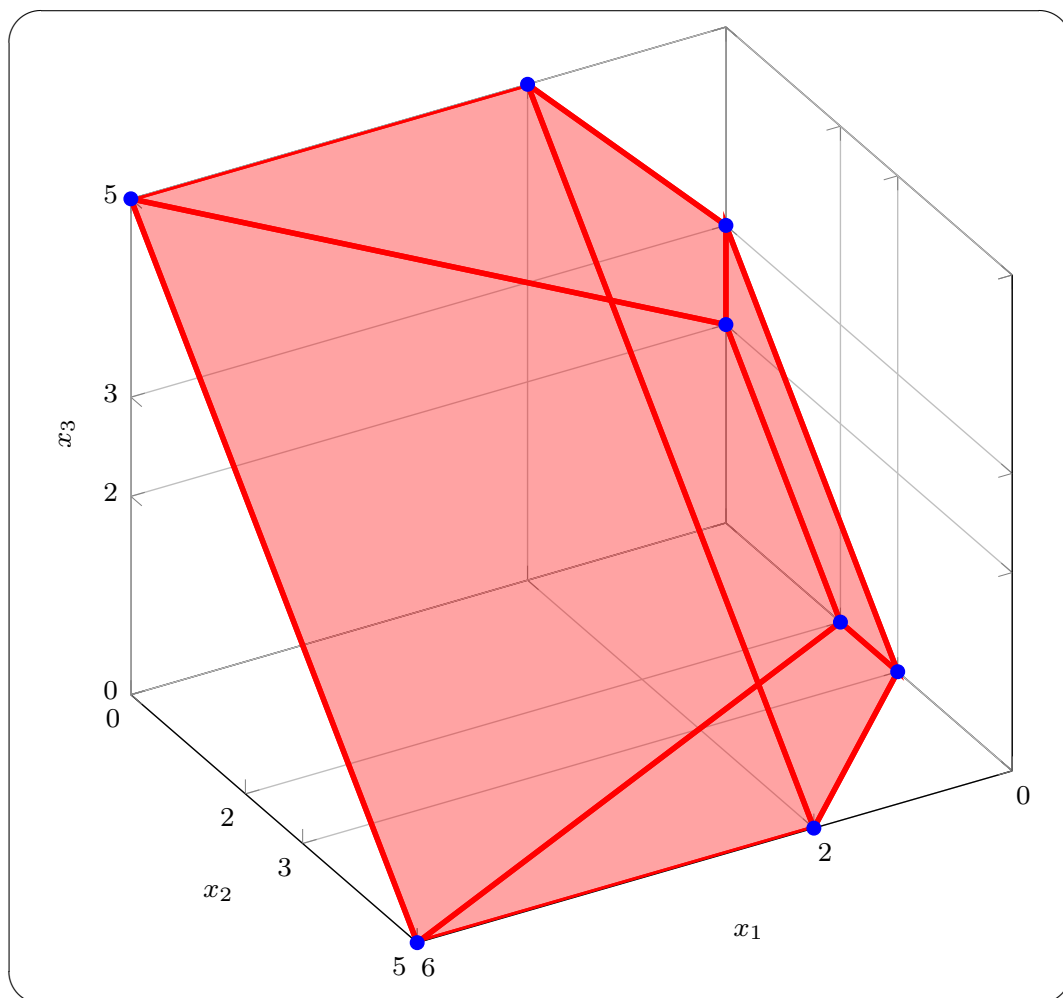
6.4 Problema LP P54

$$\begin{array}{llll}
 \max & - & x_1 & - & 2x_2 & - & 2x_3 \\
 \text{soggetto a} & & x_1 & + & 2x_2 & & \leq & 6 \\
 & & - & x_1 & - & x_2 & - & x_3 \leq -3 \\
 & & & & x_2 & + & x_3 \leq 5 \\
 & & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



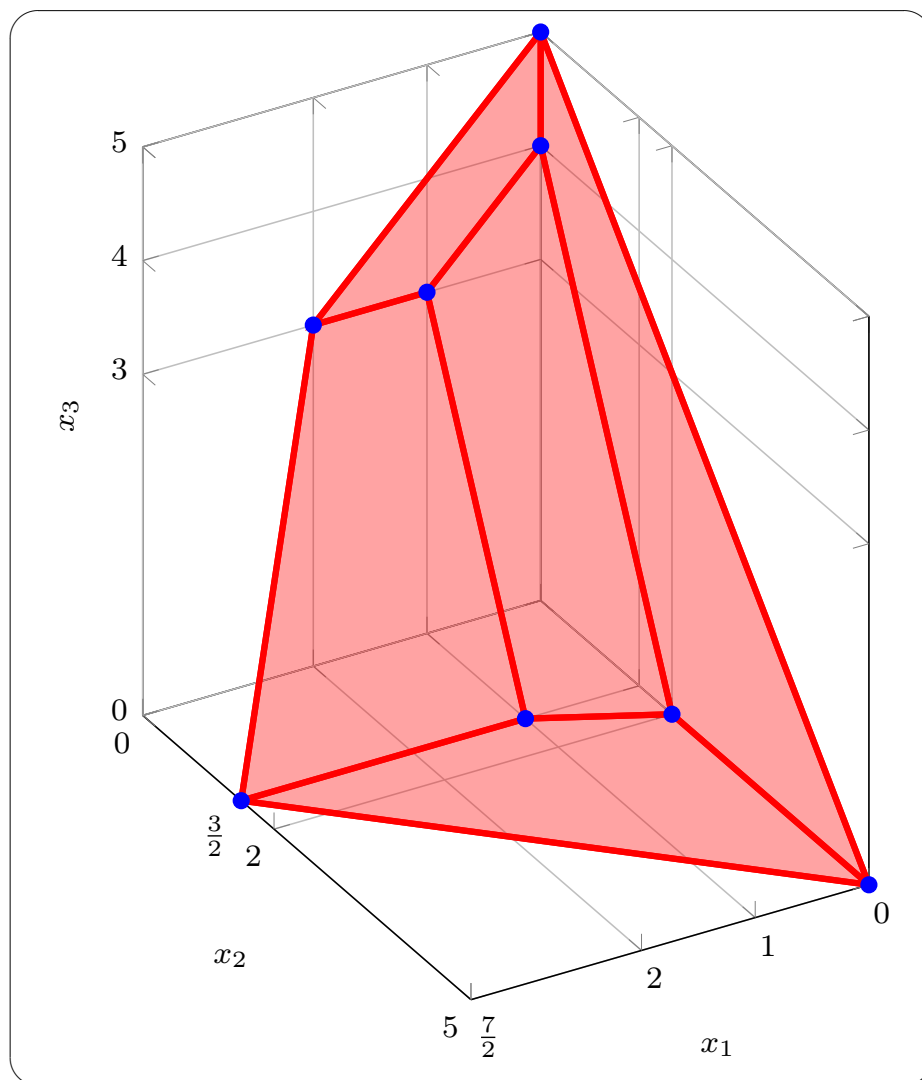
6.5 Problema LP P55

$$\begin{array}{llll}
 \max & - & 2x_1 & - & 2x_2 & - & x_3 \\
 \text{soggetto a} & & & & x_2 & + & x_3 \leq 5 \\
 & & - & x_1 & + & x_2 & + & x_3 \leq 3 \\
 & & x_1 & - & 2x_2 & - & 2x_3 \leq -4 \\
 & & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



6.6 Problema LP P56

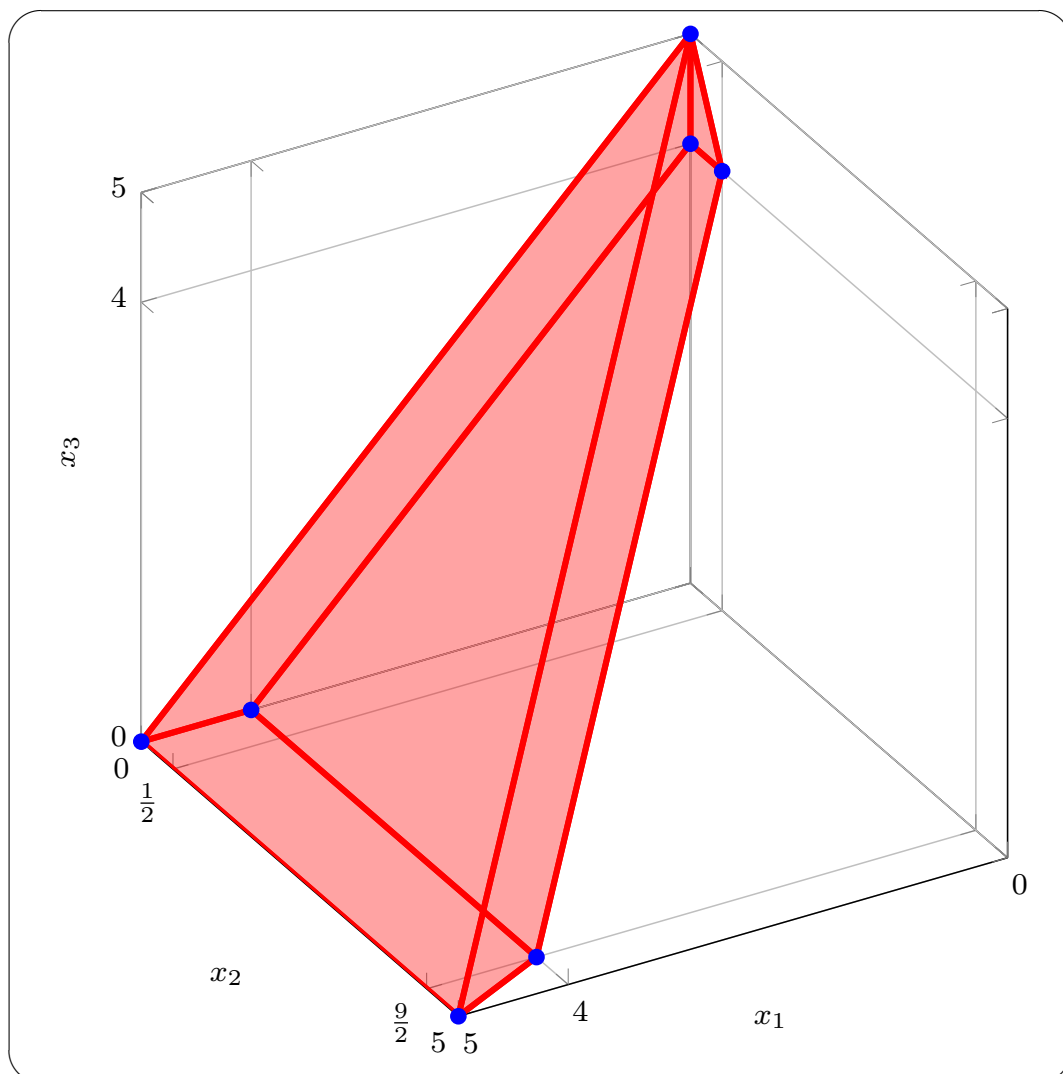
$$\begin{array}{llll}
 \max & - & 2x_1 & - & 3x_2 & - & 3x_3 \\
 \text{soggetto a} & - & x_1 & - & 2x_2 & - & x_3 \leq -4 \\
 & & & & - & 2x_2 & - & x_3 \leq -3 \\
 & & x_1 & + & x_2 & + & x_3 \leq 5 \\
 & & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



Problemi LP con tre variabili – Tipo C

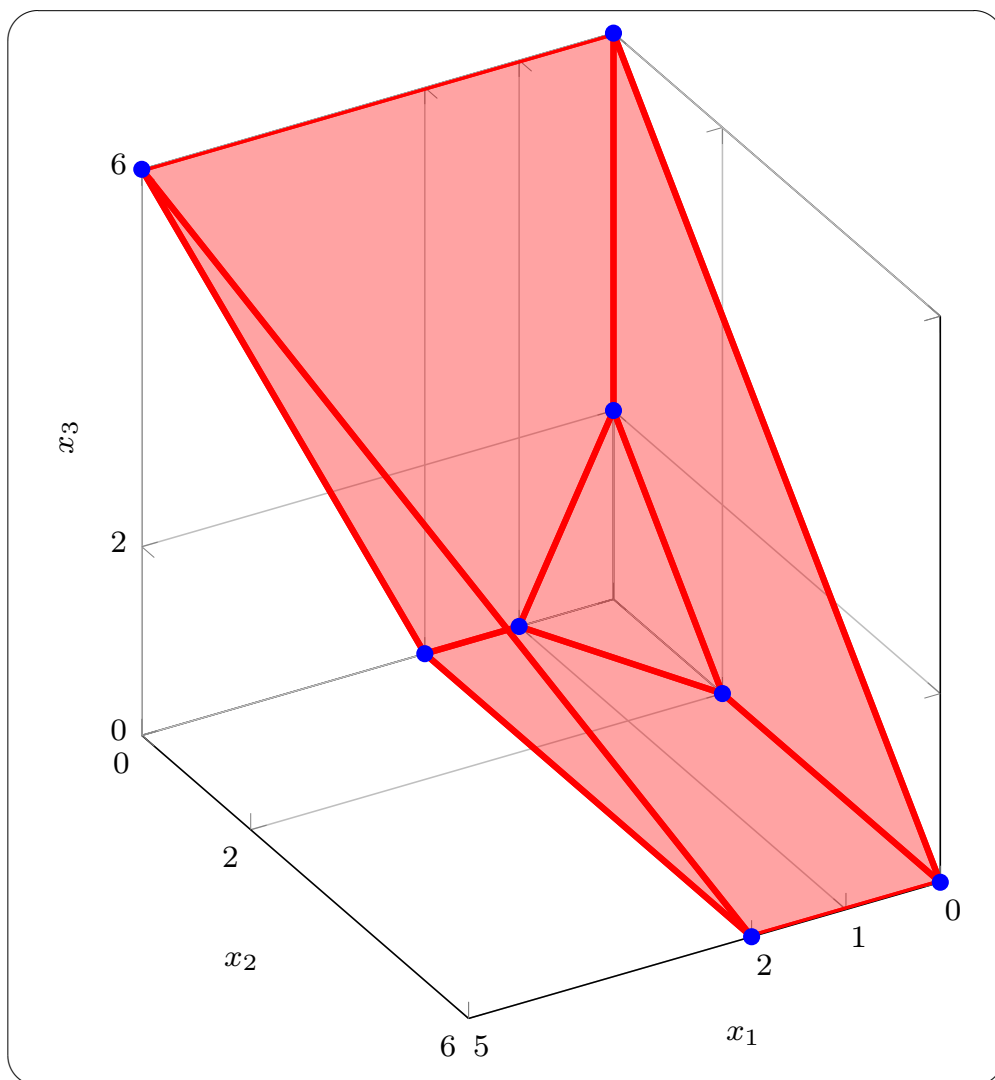
7.1 Problema LP $P61$

$$\begin{array}{llllll}
 \max & 3x_1 & + & x_2 & + & 2x_3 \\
 \text{soggetto a} & x_1 & & & + & x_3 \leq 5 \\
 & - & x_1 & & - & x_3 \leq -4 \\
 & - & x_1 & + & 2x_2 & + & x_3 \leq 5 \\
 & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



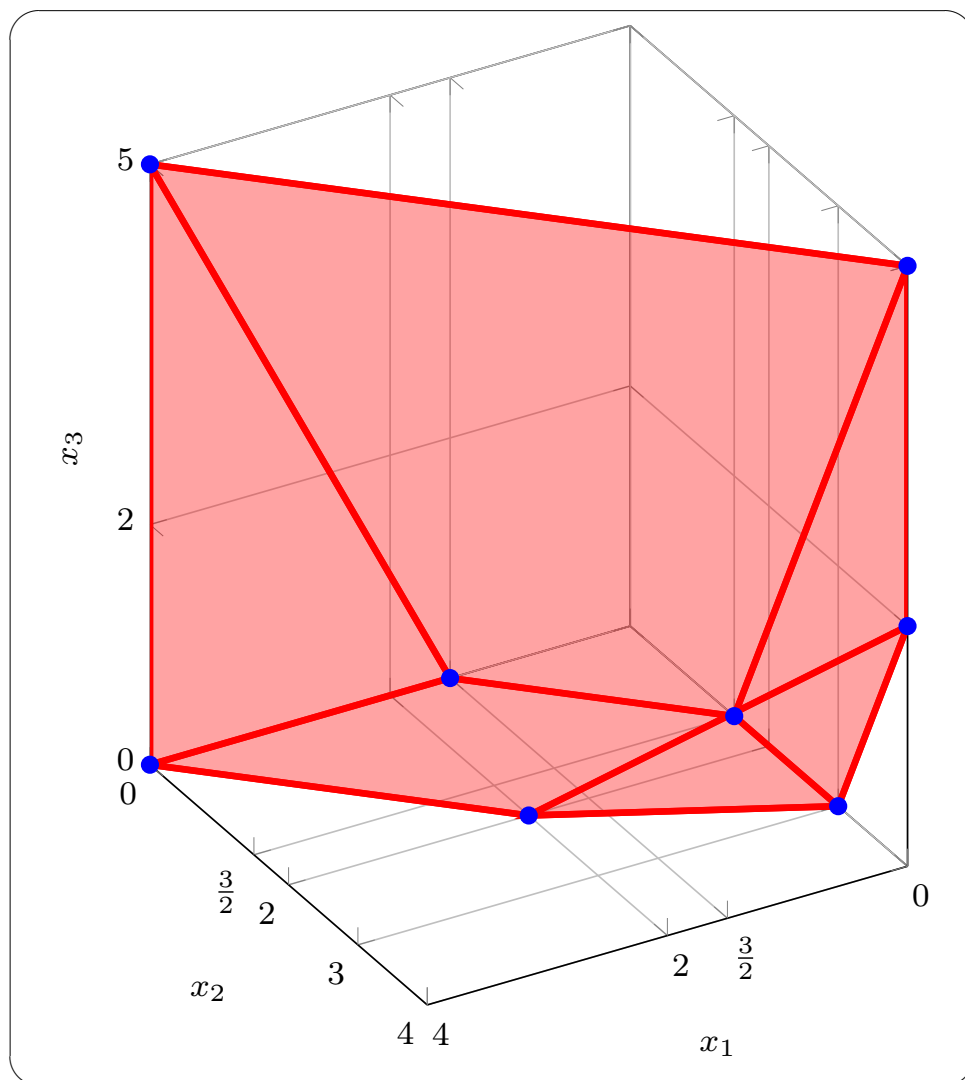
7.2 Problema LP P62

$$\begin{array}{ll}
 \max & 2x_1 + 3x_2 + x_3 \\
 \text{soggetto a} & x_2 + x_3 \leq 6 \\
 & -2x_1 - x_2 - x_3 \leq -2 \\
 & 2x_1 - x_3 \leq 4 \\
 & x_1, x_2, x_3 \geq 0
 \end{array}$$



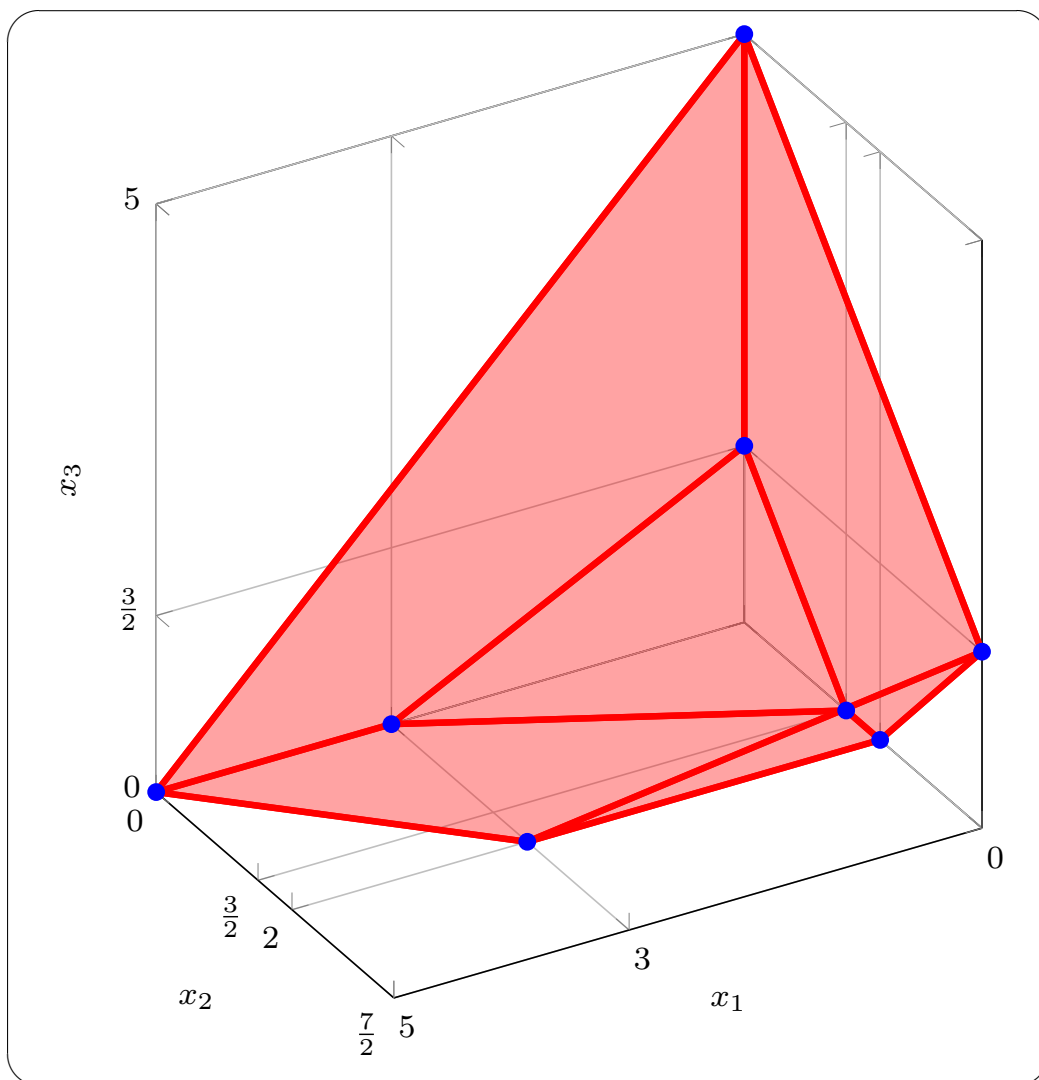
7.3 Problema LP P63

$$\begin{array}{llllll}
 \max & x_1 & + & 2x_2 & + & 2x_3 \\
 \text{soggetto a} & x_1 & + & x_2 & & \leq 4 \\
 & x_1 & + & 2x_2 & - & x_3 \leq 6 \\
 & -2x_1 & - & 2x_2 & + & x_3 \leq -3 \\
 & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



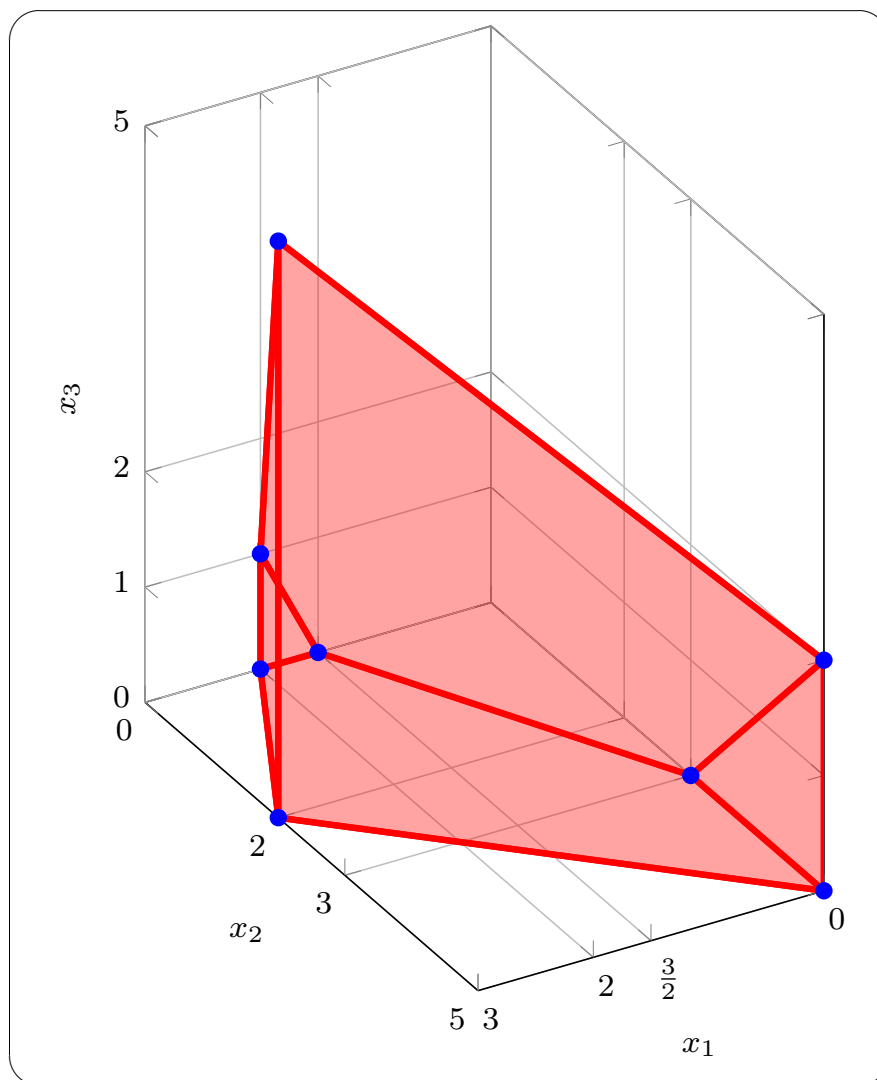
7.4 Problema LP P64

$$\begin{array}{llll}
 \max & 3x_1 & + & 2x_2 & + & x_3 \\
 \text{soggetto a} & - & x_1 & - & 2x_2 & - & 2x_3 \leq -3 \\
 & & x_1 & + & x_2 & + & x_3 \leq 5 \\
 & & & & x_2 & - & x_3 \leq 2 \\
 & & x_1, & x_2, & x_3 & \geq & 0
 \end{array}$$



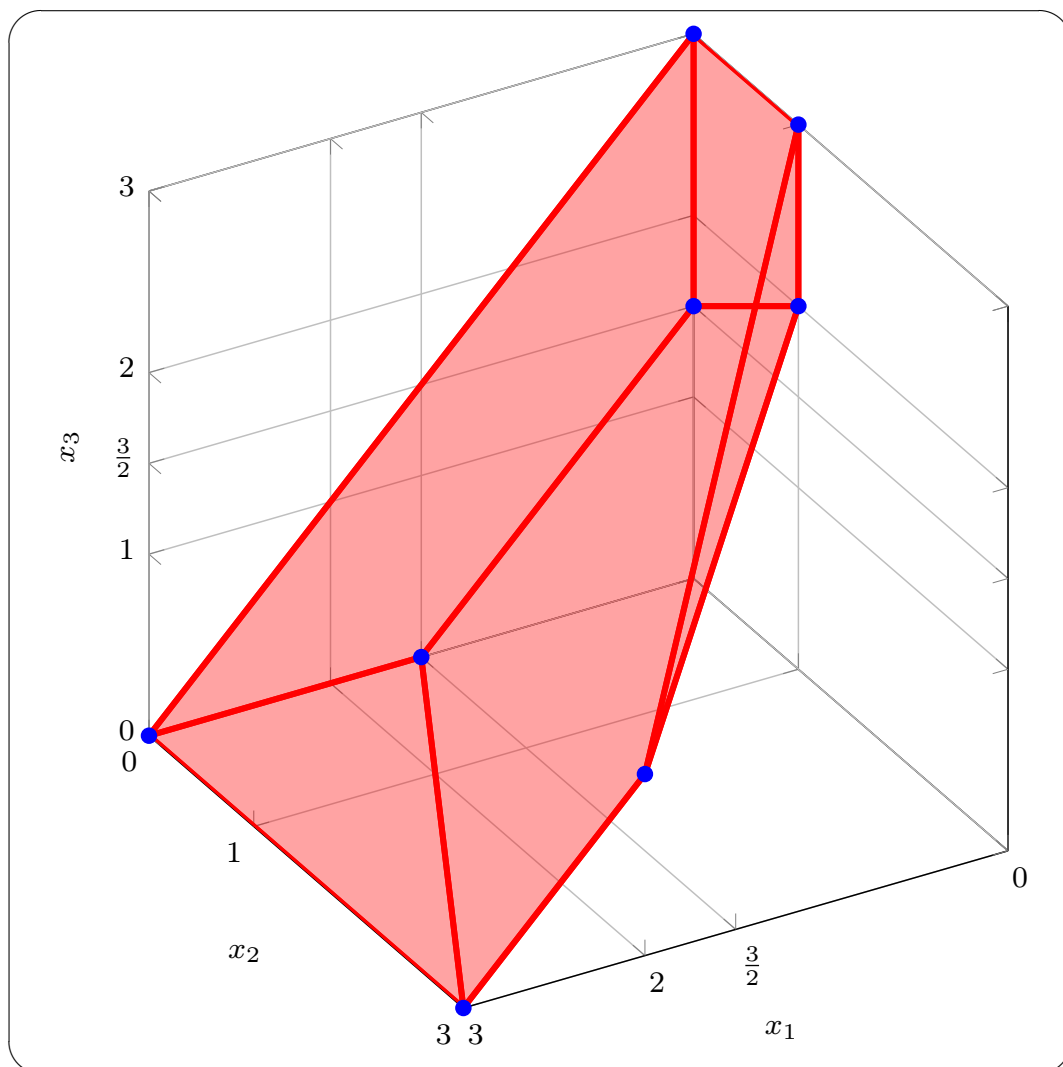
7.5 Problema LP $P65$

$$\begin{array}{llllll}
 \max & 2x_1 & + & 3x_2 & + & 3x_3 \\
 \text{soggetto a} & x_1 & + & x_2 & & \leq 5 \\
 & 2x_1 & - & x_2 & & \leq 4 \\
 & -2x_1 & - & x_2 & + & x_3 \leq -3 \\
 & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



7.6 Problema LP P66

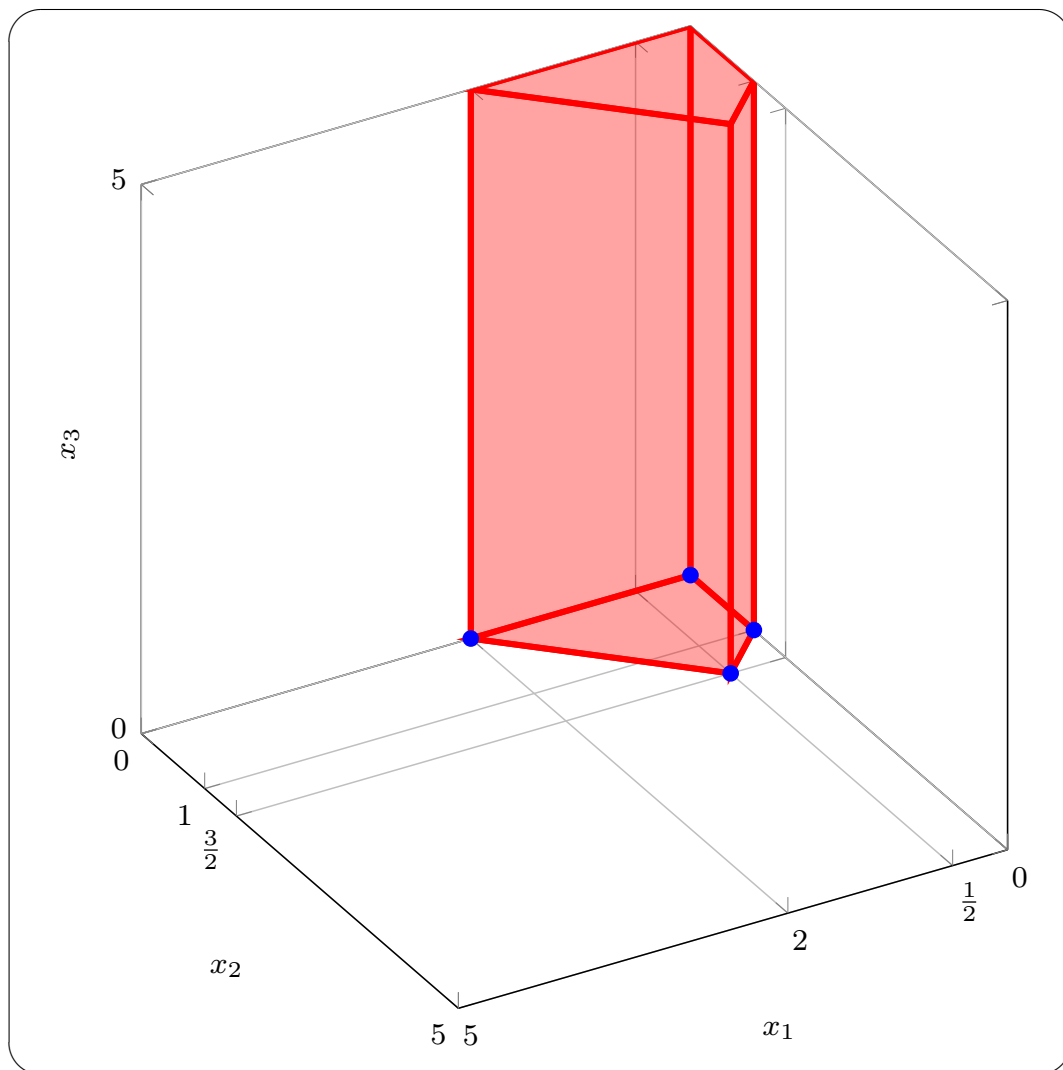
$$\begin{array}{llllll}
 \max & 2x_1 & + & x_2 & + & x_3 \\
 \text{soggetto a} & -2x_1 & + & x_2 & - & 2x_3 \leq -3 \\
 & x_1 & & & + & x_3 \leq 3 \\
 & -2x_1 & + & 2x_2 & & \leq 2 \\
 & x_1, & x_2, & x_3 & \geq & 0
 \end{array}$$



Problemi LP con tre variabili – Tipo D

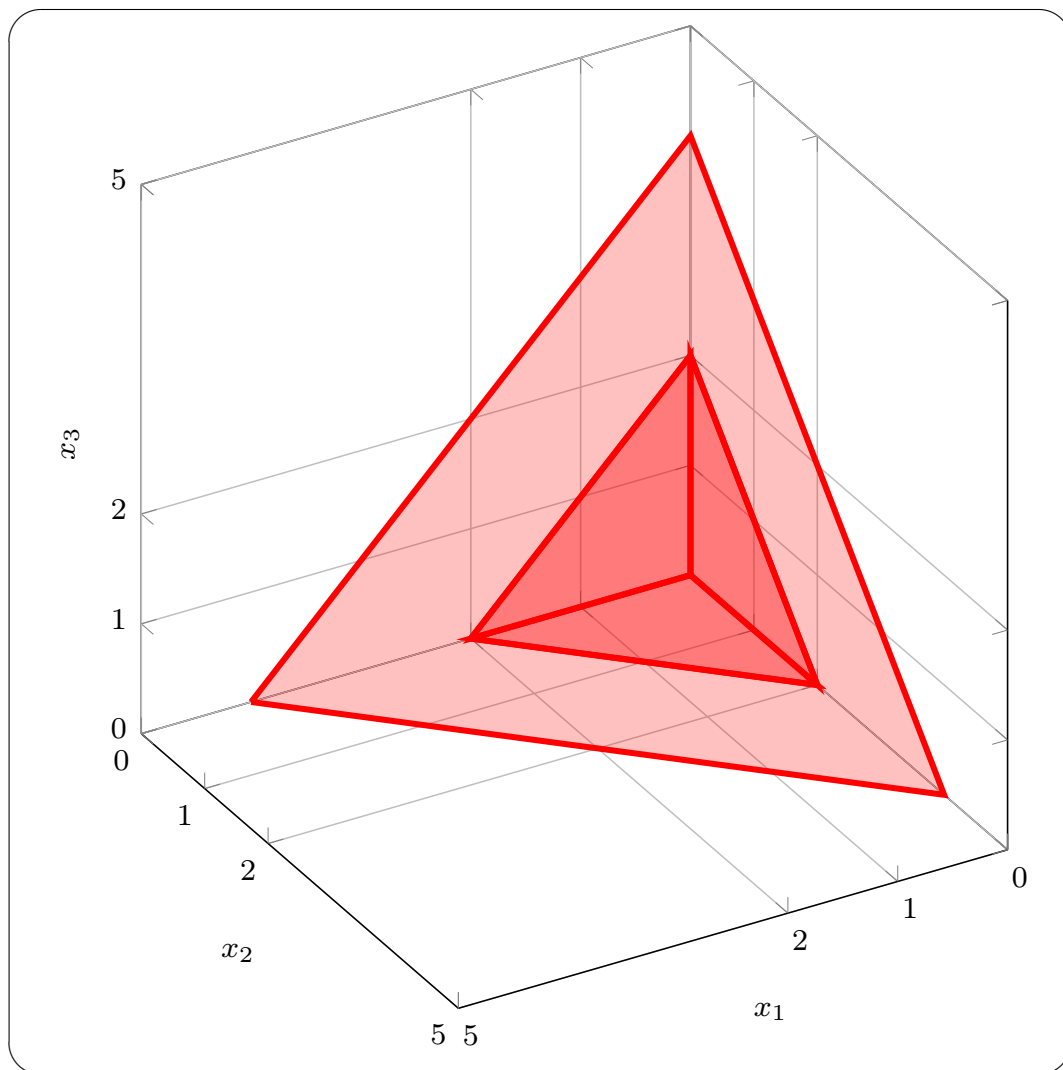
8.1 Problema LP P81

$$\begin{array}{llllll}
 \max & x_1 & + & x_2 & + & x_3 \\
 \text{soggetto a} & x_1 & + & x_2 & & \leq 2 \\
 & - & x_1 & + & x_2 & \leq 1 \\
 & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



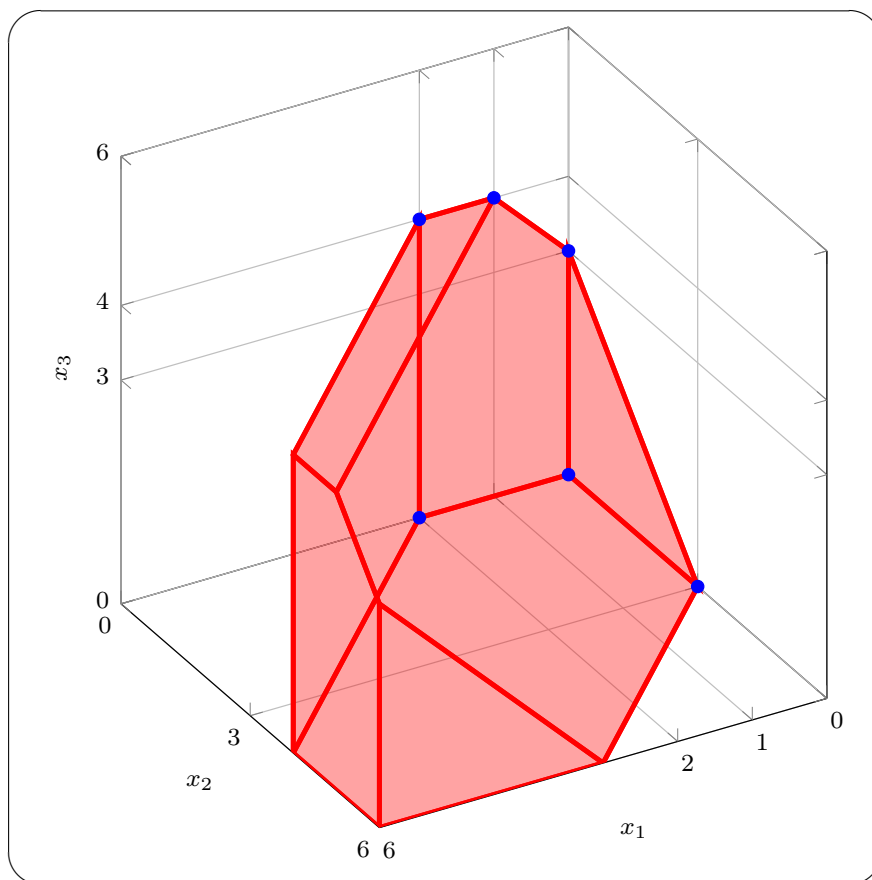
8.2 Problema LP P82

$$\begin{array}{llllll}
 \max & x_1 & + & x_2 & + & x_3 \\
 \text{soggetto a} & x_1 & + & x_2 & + & x_3 \leq 2 \\
 & - & x_1 & - & x_2 & - & x_3 \leq -4 \\
 & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



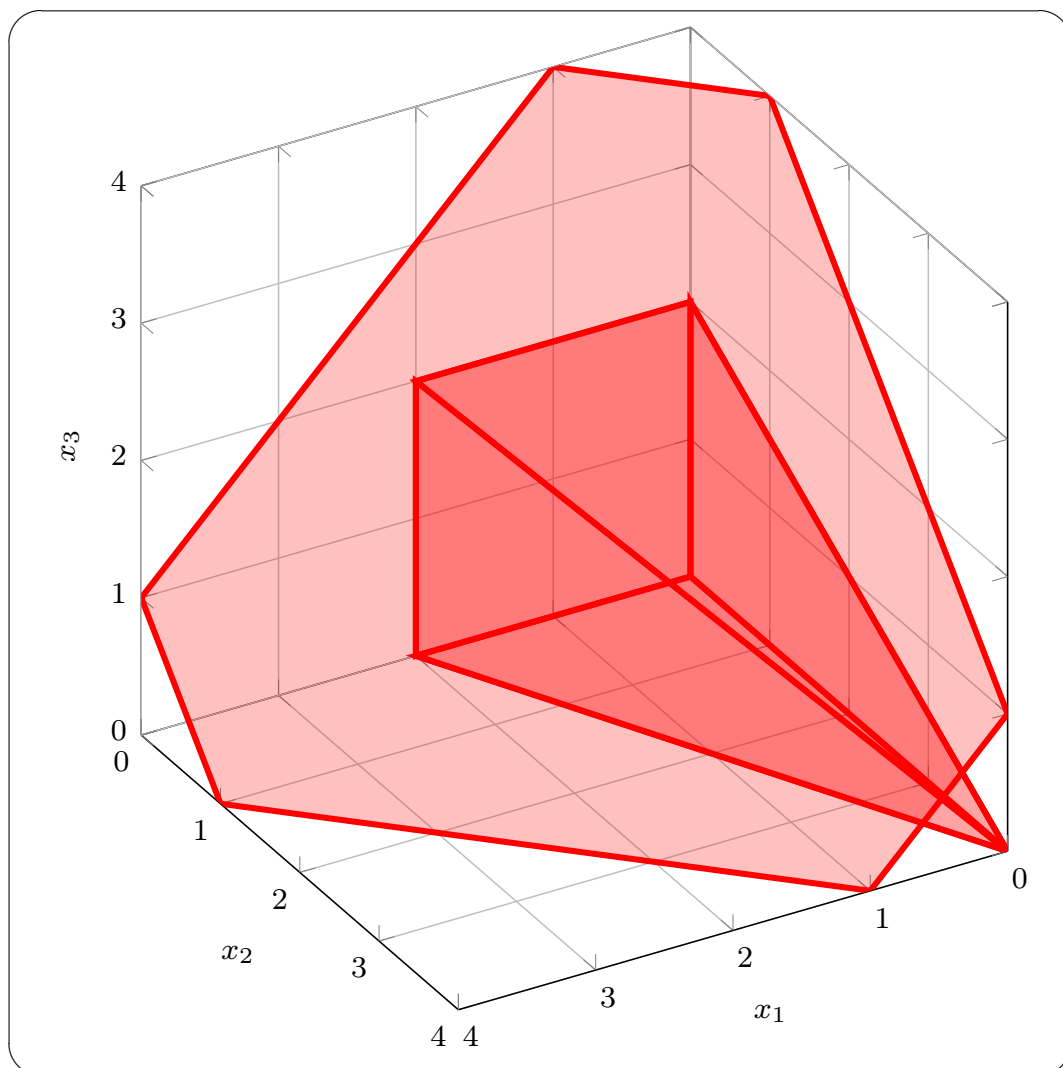
8.3 Problema LP P83

$$\begin{array}{llllll}
 \max & x_1 & + & 2x_2 & + & x_3 \\
 \text{soggetto a} & x_1 & - & x_2 & & \leq 2 \\
 & - & x_1 & + & x_2 & + x_3 \leq 3 \\
 & & & & & x_3 \leq 4 \\
 & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



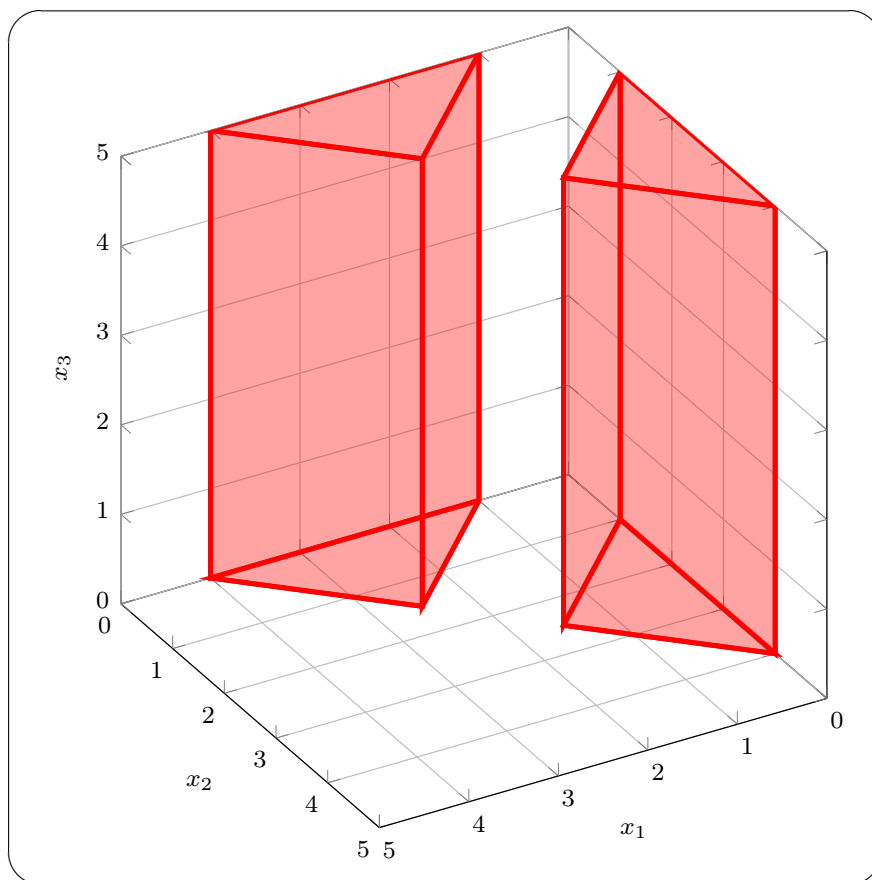
8.4 Problema LP P84

$$\begin{array}{llllll}
 \max & x_1 & + & x_2 & + & x_3 \\
 \text{soggetto a} & 2x_1 & + & x_2 & & \leq 4 \\
 & & & x_2 & + & 2x_3 \leq 4 \\
 & -x_1 & - & x_2 & - & x_3 \leq -5 \\
 & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



8.5 Problema LP P85

$$\begin{array}{llllll}
 \max & x_1 & + & x_2 & + & x_3 \\
 \text{soggetto a} & x_1 & - & x_2 & & \leq -1 \\
 & - & x_1 & + & x_2 & \leq -1 \\
 & x_1 & + & x_2 & & \leq 4 \\
 & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$



8.6 Problema LP P86

$$\begin{array}{llllll}
 \max & 2x_1 & + & 2x_2 & - & x_3 \\
 \text{soggetto a} & x_1 & + & x_2 & & \leq 4 \\
 & x_1 & & & - & x_3 \leq 1 \\
 & - & x_1 & - & x_2 & \leq -1 \\
 & x_1, & & x_2, & & x_3 \geq 0
 \end{array}$$

