Lista 04

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1- $\min \sum_{i=1}^{m} b_i y_i$

Sujeito a $\sum_{j=1}^{n} a_{ji} y_i \geq c_j$ e $y \geq 0$

2- a)

Escrivaninha → x

Mesa → y

Cadeira → w

$$\text{Max } z = 60x + 30y + 20w$$

Sujeito a: $8x + 6y + 2w \leq 48$

$3x + 2y + w \leq 20$

$2x + 2y + w \leq 8$

$x \geq 0, \ y \geq 0, \ w \geq 0$

b) $\text{Min } z = 48x_2 + 20y_2 + 8w_2$

Sujeito a: $8x_2 + 3y_2 + 2w_2 \leq 60$

$6x_2 + 2y_2 + 2w_2 \leq 30$

$2x_2 + y_2 + w_2 \leq 20$

3- a) $\text{Min } z = 24y_1 + 30y_2 + 9y_3$

Sujeito a: $8y_1 + 5y_2 + y_3 \geq 4$ $\quad y_1, y_2, y_3 \geq 0$

$3y_1 + 6y_2 + 2y_3 \geq 3$

Base	y_1	y_2	y_3	y_4	y_5	b	
y_4	-8	-5	-1	1	0	-4	$\frac{-4}{-8}$
y_5	-3	-6	-2	0	1	-3	$\frac{-3}{-2}$
z	-24	-30	-9	0	0	0	

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Base	y_1	y_2	y_3	y_4	y_5	b
y_1	1	$5/8$	$1/8$	$-1/8$	0	$1/2$
y_5	0	$-33/8$	$-17/8$	$-3/8$	1	$-3/2$
z	0	-15	-6	-3	0	12

Resultado:

$z = \frac{132}{11}$ $x_1 = 3/11$

$x_2 = 4/11$

$x_3 = 0$

$-6 - \left(\frac{+15}{-8}\right)$ $\frac{-48+15}{8} = \frac{-33}{8}$

b)

Base	x_1	x_2	x_3	x_4	x_5	b
x_3	1	2	1	0	0	7
x_4	-1	1	0	1	0	0
x_5	6	2	0	0	1	21
z	-4	3	0	0	0	0

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↑ Pivot

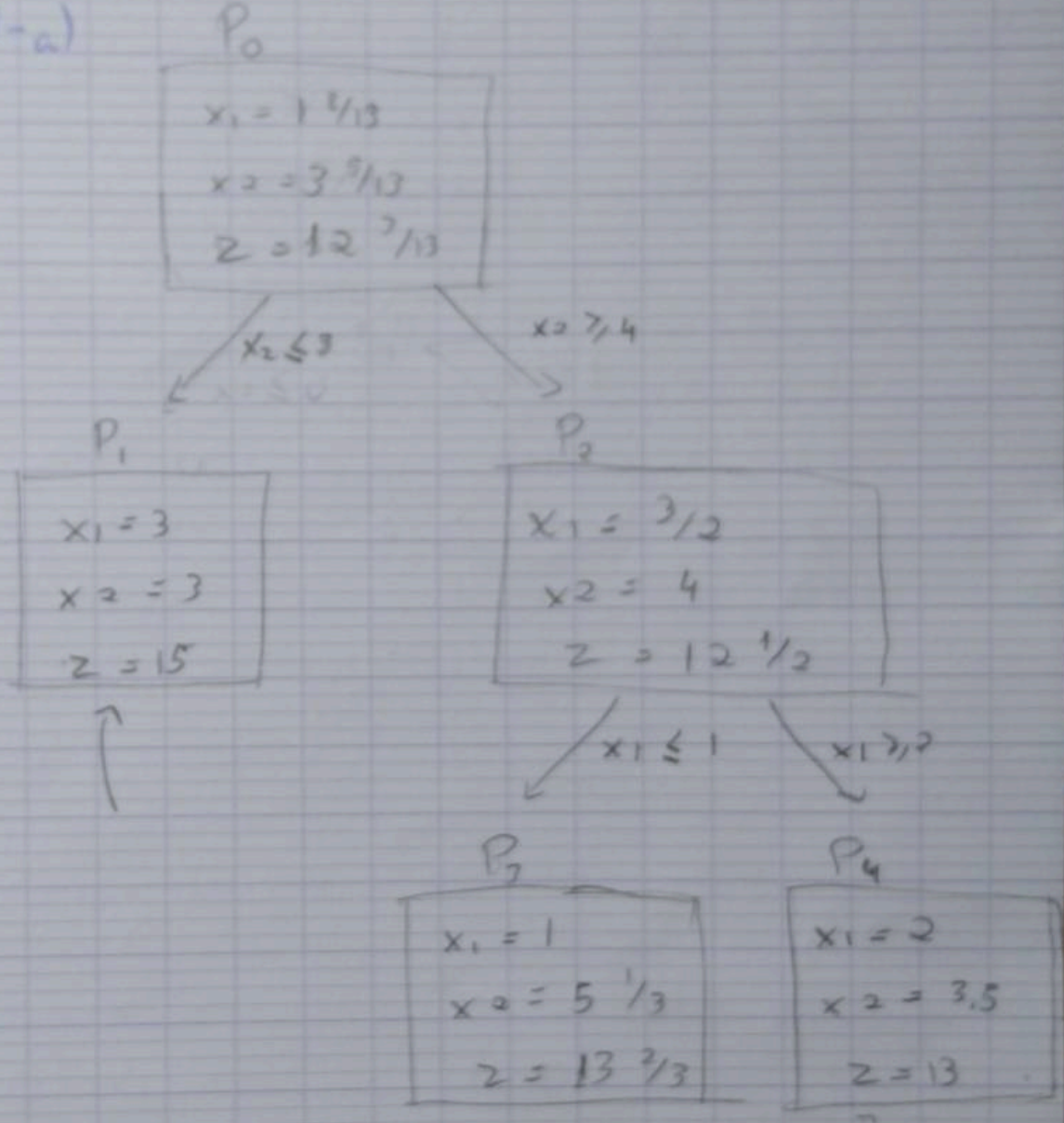
Resultado:

$z = 77/10$

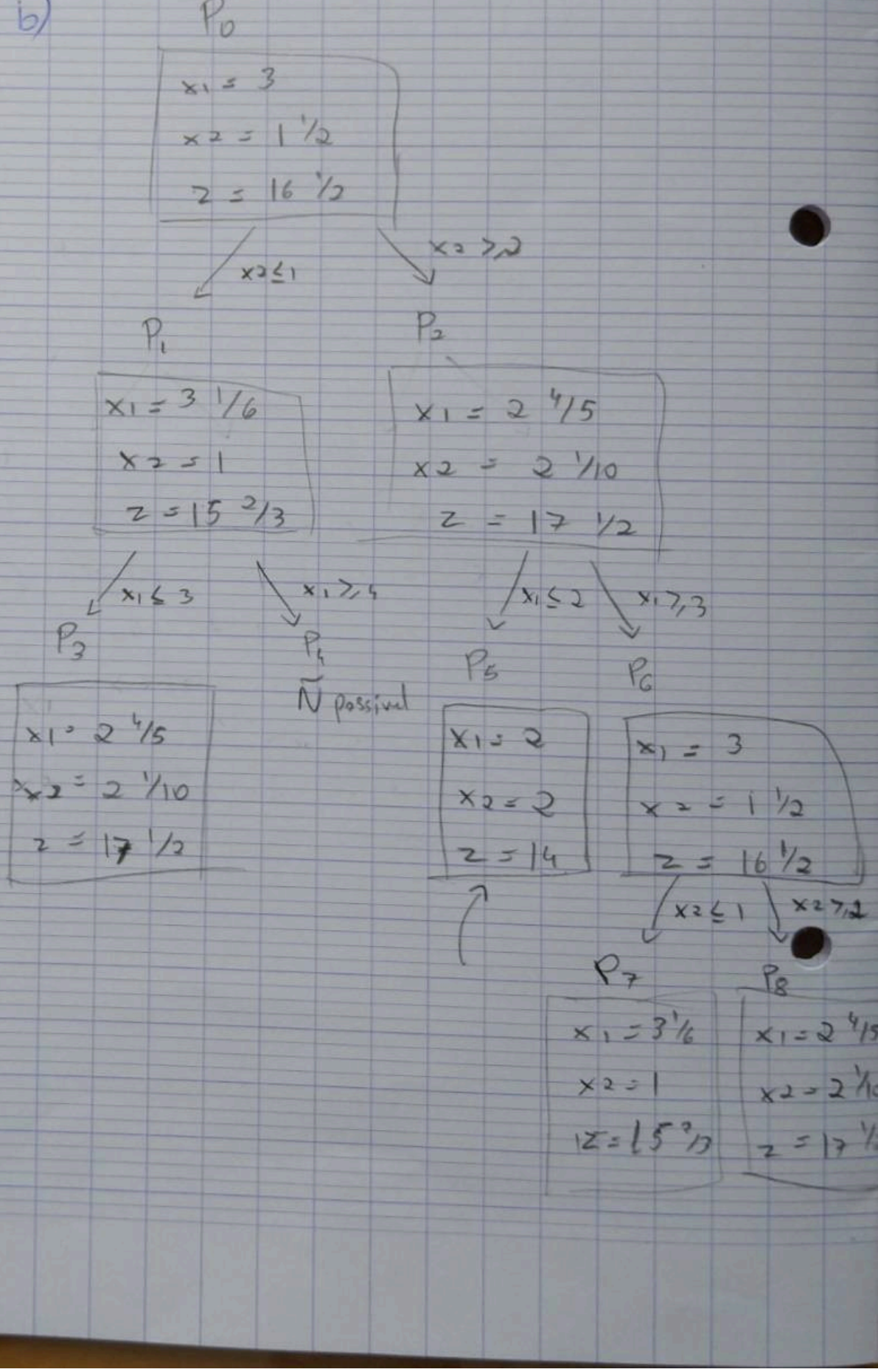
$x_1 = 14/5$

$x_2 = 21/10$

4-a)


P0
x1 = 1 4/13
x2 = 3 9/13
Z = 12 7/13
x2 ≤ 3
x2 ≥ 4
P1
x1 = 3
x2 = 3
Z = 15
P2
x1 = 3/2
x2 = 4
Z = 12 1/2
x1 ≤ 1
x1 ≥ 2
P3
x1 = 1
x2 = 5 1/3
Z = 13 2/3
P4
x1 = 2
x2 = 3,5
Z = 13

b)


P0
x1 = 3
x2 = 1 1/2
z = 16 1/2
x2 ≤ 1
x2 ≥ 2
P1
x1 = 3 1/6
x2 = 1
z = 15 2/3
P2
x1 = 2 4/5
x2 = 2 1/10
z = 17 1/2
x1 ≤ 3
x1 ≥ 4
x1 ≤ 2
x1 ≥ 3
P3
x1 = 2 4/5
x2 = 2 1/10
z = 17 1/2
P4
Ñ possível
P5
x1 = 2
x2 = 2
z = 14
P6
x1 = 3
x2 = 1 1/2
z = 16 1/2
x2 ≤ 1
x2 ≥ 2
P7
x1 = 3 1/6
x2 = 1
z = 15 2/3
P8
x1 = 2 4/5
x2 = 2 1/10
z = 17 1/2

5 -

```
c = [4, 3] # coeficientes da função objetivo
A = [[1, 2], [-1, 1],[6, 2]] #matriz de coeficientes das restrições
b = [7, 0, 21] #termos independentes


x0_bounds = (None, None) # x0 é irrestrito
x1_bounds = (None, None) # x1 >= -3

# Método padrão: simplex.



res = linprog(c, A_ub=A, b_ub=b, bounds=(x0_bounds, x1_bounds),
              options={"disp": True})

# https://docs.scipy.org/doc/scipy/reference/generated/scipy.optimize.linprog.html
```

```
Primal Feasibility  Dual Feasibility    Duality Gap         Step             Path Parameter      Objective
1.0                 1.0                 1.0                 -                1.0                 0.0
0.09313359053441    0.09313359053441    0.09313359053441    0.9108684373378  0.09313359053441    -50.93386936733
0.003126752651709   0.00312675265224    0.00312675265224    0.9755250943072  0.003126752652234   -178.750367743
1.991954954122e-07  1.991955014268e-07  1.991955013226e-07  0.9999372108747  1.991955014262e-07  -3163956.66125
9.957976721724e-12  9.959775084999e-12  9.959355315096e-12  0.9999499999999  9.959775084981e-12  -63279335171.1
The algorithm terminated successfully and determined that the problem is unbounded.
         Iterations: 4
```

```
c = [3, 2] # coeficientes da função objetivo
A = [[8, 3], [5, 6],[1, 2]] #matriz de coeficientes das restrições
b = [24, 30, 9] #termos independentes


x0_bounds = (None, None) # x0 é irrestrito
x1_bounds = (None, None) # x1 >= -3

# Método padrão: simplex.



res = linprog(c, A_ub=A, b_ub=b, bounds=(x0_bounds, x1_bounds),
              options={"disp": True})

# https://docs.scipy.org/doc/scipy/reference/generated/scipy.optimize.linprog.html
```

```
Primal Feasibility  Dual Feasibility    Duality Gap         Step             Path Parameter      Objective
1.0                 1.0                 1.0                 -                1.0                 0.0
0.1260566912391     0.1260566912391     0.1260566912391     0.878095960448   0.1260566912391     4.120907833124
0.008949518955858   0.008949518955849   0.008949518955849   0.9333252902334  0.008949518955849   -18.972647047
4.53455694337e-06   4.53455735413e-06   4.534557353868e-06  0.9996952283899  4.534557354136e-06  -86981.48053483
2.267316987811e-10  2.267282005605e-10  2.267280423593e-10  0.9999499999266  2.26728200561e-10   -1739732648.596
The algorithm terminated successfully and determined that the problem is unbounded.
         Iterations: 4
```