

19/06/22

① Desenvolva o algoritmo B.e.B para cada um dos seguintes problemas de conveniência, sempre selecionando como alternativa de rotulamento no problema.

$$(a) \max f(x) = 3x_1 + 2x_2$$

$$\text{s.a } 2x_1 + 5x_2 \leq 9 \quad z = 6$$

$$4x_1 + 2x_2 \leq 9 \quad x_1 = 2$$

$$x_1, x_2 \geq 0 \quad x_2 = 0$$

$$x_1, x_2 \in \mathbb{Z}$$

$$(b) \max f(x) = x_1 + x_2 \quad z = 4$$

$$\text{s.a } 2x_1 + 5x_2 \leq 16 \quad x_1 = 3$$

$$6x_1 + 5x_2 \leq 27 \quad x_1 = 1$$

$$x_1, x_2 \geq 0$$

$$x_1, x_2 \in \mathbb{Z}$$

$$(c) \max f(x) = 5x_1 + 1x_2 \quad z = 4$$

$$\text{s.a } 2x_1 + x_2 \leq 13 \quad x_1 = 2$$

$$5x_1 + 9x_2 \leq 41 \quad x_2 = 0$$

$$x_1, x_2 \geq 0$$

$$x_1, x_2 \in \mathbb{Z}$$

② Mentre graficamente que o seguinte problema de PL não tem nenhuma solução trivial e então verifique o resultado usando B.e.B

$$\max f(x) = 2x_1 + x_2$$

$$\text{s.a } 10x_1 + 10x_2 \leq 9 \quad z = 0$$

$$10x_1 + 5x_2 \leq 1 \quad x_1 = 0$$

$$x_1, x_2 \geq 0 \quad x_2 = 0$$

$$x_1, x_2 \in \mathbb{Z}^2$$

③ Resolva o problema de programação inteira

13.2.22

$$\text{Maxf. } f(x) = x_1 + x_2$$

$$\text{s.a. } \begin{aligned} & 2x_1 + 2x_2 \leq 3 \\ & x_1 + 2x_2 \leq 2 \\ & x_1, x_2 \in \mathbb{Z}^+ \end{aligned}$$

$$\begin{array}{l} x_1 = 1 \\ x_2 = 2 \end{array}$$

- (a) Grafische
 (b) Ble meðalabréðslu - and - bárd.

Ritunum e. Reglas

~~DEF~~ max f(x) = 3x_1 + 2x_2

s.a. $\begin{aligned} & 2x_1 + 5x_2 \leq 9 \\ & 4x_1 + 2x_2 \leq 9 \\ & x_1, x_2 \geq 0 \\ & x_1, x_2 \in \mathbb{Z} \end{aligned}$

$$\begin{aligned} 2x_1 + 5x_2 &= 9 \\ 2.0 + 5x_2 &= 9 \\ 0 + 5x_2 &= 9 \\ 5x_2 &= 9 \\ x_2 &= \frac{9}{5} \\ x_2 &= 1.8 \end{aligned}$$

x_1	x_2
0	1.8
4.5	0

$$2x_1 + 5x_2 = 9$$

$$2x_1 + 5.0 = 9$$

$$2x_1 + 0 = 9$$

$$2x_1 = 9 - 0$$

$$2x_1 = 9$$

$$x_1 = \frac{9}{2}$$

$$(x_1 - 4.5)$$

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$$\begin{array}{l} \text{II } 4x_1 + 2x_2 = 9 \\ 4.0 + 2x_2 = 9 \\ 0 + 2x_2 = 9 \\ 2x_2 = 9 - 0 \end{array}$$

$$\begin{array}{|c|c|} \hline x_1 & x_2 \\ \hline 0 & 4.5 \\ \hline 2x_2 & 0 \\ \hline \end{array}$$

$$\begin{array}{l} 2x_2 = 9 \\ x_2 = 4.5 \\ 4x_1 + 2x_2 = 9 \\ 4x_1 + 2 \cdot 4.5 = 9 \\ 4x_1 + 9 = 9 \\ 4x_1 = 9 - 9 \\ 4x_1 = 0 \\ x_1 = 0 \end{array}$$

$$\begin{array}{l} \text{III } 2x_1 + 5x_2 = 9 \\ 2x_1 + 2x_2 = 9 \\ 2x_1 + 2 + 3x_2 = 9 \\ 2x_1 + 3x_2 = 9 - 2 \\ 2x_1 + 3x_2 = 7 \end{array}$$

$$\begin{array}{l} -4x_1 - 10x_2 = -18 \\ 4x_1 + 2x_2 = 9 \\ 0 - 8x_2 = -9 \\ -8x_2 = -9 \\ x_2 = 1.125 \end{array}$$

$$\begin{array}{l} 2x_1 + 5x_2 = 9 \\ 2x_1 + 5 \cdot 1.125 = 9 \\ 2x_1 + 5.625 = 9 \\ 2x_1 = 9 - 5.625 \\ 2x_1 = 3.375 \end{array}$$

$$\begin{array}{l} x_1 = 1.125 \\ x_2 = 1.125 \end{array}$$

$$x_1 = 1.125$$

$$x_1 < 1.125$$

$$x_1 > 1.125$$

$$\begin{array}{l} 5.000 \\ 1.125 \\ 3.375 \\ 10.000 \\ 5.000 \\ 1.125 \\ 5.625 \end{array}$$

$$\begin{array}{l} x_1 + x_2 \\ 10.000 + 1.125 = 11.125 \\ 11.125 + 3.375 = 14.500 \\ 14.500 + 5.000 = 19.500 \\ 19.500 + 1.125 = 20.625 \end{array}$$

19.06.22

$$\begin{array}{|c|c|} \hline & 9,31 \\ \hline x_1 = 2,7 & x_2 = \frac{9}{8} \\ \hline 16 & \\ \hline 18 \times 52 & \\ \hline \end{array}$$

 $x_1 < 1$ $x_1 > 2$

$x_1 = 1$

$2x_1 + 5x_2 = 9$

$2 \cdot 1 + 5x_2 = 9$

$2 + 5x_2 = 9$

$5x_2 = 9 - 2$

$5x_2 = 7$

$x_2 = \frac{7}{5}$

$x_2 = 1,4 \quad (1,1,4)$

$(2,0)$

$(2,0)$

$(2,0)$

$4x_1 + 2x_2 = 9$

$x_1 = 2$

$4 \cdot 2 + 2x_2 = 9$

$8 + 2x_2 = 9$

$2x_2 = 9 - 8$

$x_2 = 1$

$x_2 = \frac{1}{1}$

$\underline{\underline{0,0}}$

$z = 5,8$

$x_1 = 1$

$x_2 = 1,4 \quad (1,1,4)$

$18 \times 2 \times 52$

$z = 1$

$x_1 = 2$

$x_1 = 0,5 \quad (1,1,1)$

$\underline{\underline{0,0}}$

$z = 5,8$

$x_1 = 0,5 \quad (1,1,1)$

$\underline{\underline{0,0}}$

$z = 5,8$

$x_1 = 0,5 \quad (1,1,1)$

$\underline{\underline{0,0}}$

$z = 5,8$

$x_1 = 0,5 \quad (1,1,1)$

$\underline{\underline{0,0}}$

19.08.20

b) max $P(x) = x_1 + x_2$
 $\text{s. a. I } 2x_1 + 5x_2 \leq 16$
 $\text{II } 6x_1 + 5x_2 \leq 27$
 $x_1, x_2 \geq 0$
 $x_1, x_2 \in \mathbb{N}$

(I) $2x_1 + 5x_2 = 16$
 $2 \cdot 0 + 5x_2 = 16$
 $0 + 5x_2 = 16$
 $5x_2 = 16 - 0$
 $5x_2 = 16$
 $x_2 = \frac{16}{5}$
 $x_2 = 3,2$

x_1	x_2
0	3,2
8	0

$2x_1 + 5x_2 = 16$
 $2x_1 + 5 \cdot 0 = 16$
 $2x_1 + 0 = 16$
 $2x_1 = 16 - 0$
 $2x_1 = 16$
 $x_1 = \frac{16}{2}$
 $x_1 = 8$

(II) $6x_1 + 5x_2 = 27$
 $6 \cdot 0 + 5x_2 = 27$
 $0 + 5x_2 = 27$
 $5x_2 = 27 - 0$
 $5x_2 = 27$
 $x_2 = \frac{27}{5}$
 $x_2 = 5,4$

x_1	x_2
0	5,4
5	0

19.06.22

$$6x_1 + 5x_2 = 27$$

$$6x_1 + 5 \cdot 0 = 27$$

$$6x_1 + 0 = 27$$

$$6x_1 = 27 - 0$$

$$6x_1 = 27$$

$$\underline{x_1 = \frac{27}{6}}$$

$$x_1 = 4,5$$

$$(-3) 2x_1 + 5x_2 = 16$$

$$6x_1 + 5x_2 = 27$$

$$-6x_1 - 15x_2 = -48$$

$$6x_1 + 5x_2 = 27$$

$$\textcircled{1} - 10x_2 = 27$$

$$x_2 = \frac{-21}{-10}$$

$$\underline{\underline{x_2 = 2,1}}$$

$$2x_1 + 5x_2 = 16$$

$$2x_1 + 5 \cdot 2,1 = 16$$

$$2x_1 + 10,4 = 16$$

$$2x_1 = 16 - 10,4$$

$$2x_1 = 5,6$$

$$\underline{x_1 = \frac{5,6}{2}}$$

$$\underline{\underline{x_1 = 2,8}}$$

$$(2,8; 2,1)$$

$$2,8 + 2,1 = 4,9$$

$$\boxed{\begin{array}{l} z = 4,9 \\ x_1 = 2,8 \quad x_2 = 2,1 \\ 2 \leq x_1 \leq 3 \end{array}} \quad A$$

x_2

$$2x_1 + 5x_2 = 16$$

$$2x_1 + 5x_2 = 16$$

$$4 \cdot 5x_2 = 16$$

$$5x_2 = 16 - 4$$

$$5x_2 = 12$$

$$\underline{x_2 = \frac{12}{5}}$$

$$\underline{\underline{x_2 = 2,4}}$$

$$2 \leq x_2 \leq 3$$

$$z = 2 + 2,4$$

$$z = 4,4$$

$$\boxed{\begin{array}{l} z = 4,4 \\ x_1 = 2,8 \quad x_2 = 2,4 \\ 2 \leq x_1 \leq 3 \end{array}} \quad B$$

19 Dec

X1.2
X1.2
~~2.772~~
~~2.442~~

64+51=11
64+51=11
64+51=11
64+51=11
64+51=11
64+51=11
64+51=11

M
2-3+0,
2-35
05 n61

5
963
- 6-34

2.71+1.7

64+51=11
64+51=11

(Q)

2-3+1.8
2-4.8

16+51=11
51-3
51-2
51-3

0.61 + 1.1

Sum of 0.32 and 0.68
0.68 + 0.32

64+51=11

64+51=11

64+51=11

64+51=11

64+51=11

64+51=11

64+51=11

64+51=11

64+51=11

64+51=11

64+51=11

18.03.22

$$6,3 + 5x_1 = 17$$

$$6,3 + 5x_2 = 16$$

$$6 + 5x_1 = 15$$

$$5x_2 = 16 - 6$$

$$5x_2 = 10$$

$$x_2 = 10 \quad | \quad \frac{5}{5}$$

$$\boxed{x_2 = 2}$$

$$z = 3 + 1$$

$$\boxed{z = 4}$$

$$6,4 + 5x_2 = 17$$

$$24 + 5x_1 = 17$$

$$5x_1 = 17 - 24$$

$$5x_1 = -3$$

$$x_1 = \underline{\underline{-3}}$$

$$\boxed{x_1 = 0,6}$$

$$z = 4 + 0,6$$

$$\boxed{z = 4,6}$$

$$0,5 \leq x_2 \leq 1$$

$$6x_1 + 5x_2 = 17$$

$$(6,4 + 5,0 = 17)$$

$$6x_1 + 0 = 17$$

$$6x_1 = 17 - 0$$

$$6x_1 = 17$$

$$x_1 = \underline{\underline{2,83}}$$

$$\boxed{x_1 = 4,5}$$

$$\boxed{z = 4,5 + 0}$$

$$\boxed{z = 4,5}$$

$$4,5 \leq x_1 \leq 5$$

Dam Polinomos

$$\boxed{z = 4 + 0}$$

$$\boxed{z = 4}$$

③ $\begin{cases} 2x_1 + 3x_2 \leq 12 \\ 5x_1 + 9x_2 \leq 41 \\ x_1, x_2 \geq 0 \\ x_1, x_2 \in \mathbb{Z} \end{cases}$

91 19
36 45
050
45
050

$$\begin{array}{l|ll} I) & 2x_1 + x_2 = 13 & x_1 | x_2 \\ & 2, 0 + x_2 = 13 & 0 | 13 \\ & 0 + x_2 = 13 & 6, 5 | 0 \\ & x_2 = 13 - 0 & \\ & x_2 = 13 & \end{array}$$

41 15
50 8
0 13

$$\begin{array}{l} 2x_1 + x_2 = 13 \\ 2x_1 + 0 = 13 \\ 2x_1 = 13 - 0 \\ 2x_1 = 13 \\ x_1 = \frac{13}{2} \\ x_1 = 6,5 \end{array}$$

19
0

$$\begin{array}{l|ll} II) & 5x_1 + 9x_2 = 41 & x_1 | x_2 \\ & 5, 0 + 9x_2 = 41 & 0 | 41 \\ & 0 + 9x_2 = 41 & 8, 7 | 0 \\ & 9x_2 = 41 - 0 & \\ & 9x_2 = 41 & \\ & x_2 = \frac{41}{9} & \end{array}$$

$$\begin{array}{l} 5x_1 + 9x_2 = 41 \\ 5x_1 + 9,0 = 41 \\ 5x_1 = 41 - 9 \\ 5x_1 = 32 \\ x_1 = \frac{32}{5} \\ x_1 = 6,4 \end{array}$$

21 82

$$\begin{aligned} -9x_1 + x_2 &= 13 \\ 5x_1 + 9x_2 &= 41 \end{aligned}$$

$$\begin{array}{r} 119 \\ -91 \\ \hline 20 \\ -18 \\ \hline 2 \\ 020 \end{array}$$

$$\begin{aligned} -18x_1 - 9x_2 &= -117 \\ 5x_1 + 9x_2 &= 41 \end{aligned}$$

$$-13x_1 = 76$$

$$\begin{array}{r} 76 \\ -13 \\ \hline \end{array}$$

$$x_1 = -6 (-1)$$

$$x_1 = 6$$

$$\begin{array}{r} 13 \\ -9 \\ \hline 4 \\ 117 \end{array}$$

$$\begin{array}{r} 41 \\ 76 \\ \hline 117 \end{array}$$

$$5x_1 + 9x_2 = 41$$

$$x_1 = 6$$

$$1400$$

$$30 + 9x_2 = 41$$

$$x_2 = 1,22$$

$$900$$

$$9x_2 = 41 - 30$$

$$85400$$

$$9x_2 = 11$$

$$\begin{array}{r} 11 \\ -9 \\ \hline \end{array}$$

$$x_2 = 1,22$$

$$2x_1 + x_2 = 13$$

$$1300$$

$$2 \cdot 6 + x_2 = 13$$

$$122$$

$$13 + x_2 = 13$$

$$11,78$$

$$x_2 = 13 - 13$$

$$0$$

$$\begin{array}{r} 1 \\ -1 \\ \hline \end{array}$$

$$2x_1 + x_2 = 13$$

$$2x_1 + x_2 = 13$$

$$018$$

$$2 \cdot 6 + x_2 = 13$$

$$2x_1 + 1,22 = 13$$

$$18$$

$$12 + x_2 = 13$$

$$2x_1 = 13 - 12$$

$$0$$

$$x_1 = 13 - 12$$

$$2x_1 = 1,78$$

$$16$$

$$x_1 = 1$$

$$018$$

$$500$$

$$589$$

$$4500$$

$$4000$$

$$2500$$

$$294500$$

19.06.2022

$$t = 37,69$$

$$x_1 = 5,89$$

$$x_2 = 1,72$$

$$5 \leq x_1 \leq 6$$

$$t = 37$$

$$x_1 = 6$$

$$x_2 = 1$$

$$t = 37$$

$$x_1 = 6$$

$$4 \leq x_1 \leq 5$$

$$t = 39,65$$

Demnach

$$x_1 = 6,33$$

$$x_2 = 4$$

$$2 \cdot 38,94$$

$$2 \cdot 5,69 + 7,11$$

$$2 \cdot 19,61 + 8,54$$

$$2 \cdot 35,98$$

$$5x_1 + 3x_2 = 41$$

$$5x_1 + 9x_2 = 41$$

$$5x_1 + 3x_2 = 41$$

$$5x_1 + 9x_2 = 41$$

		5,69	19,61	35,98	5,69 + 19,61 + 35,98	60
2	5,69	19,61	35,98	60,68	60,68	60
2	19,61	5,69	35,98	50,28	50,28	50
2	35,98	5,69	19,61	55,27	55,27	55
2	5,69	35,98	19,61	55,27	55,27	55

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18.06.2022

$$\begin{aligned}t &= 2.0 + \gamma_1 \\&= 2.0 + 0.1 \\&= 2.1\end{aligned}$$

$$\begin{aligned}t &= 0.01 \\&= 0.01 \\&= 0.01\end{aligned}$$

$$1.60157$$

Don't know

$$\begin{aligned}t &= 1.0 + \gamma_1 - 0.01 \\&= 1.0 + 0.1 - 0.01 \\&= 1.099\end{aligned}$$

Don't know

$$\begin{aligned}t &= 0 \\&= 0 \\&= 0\end{aligned}$$

10.0 + 0.0 - 1

$$\begin{aligned}t &= 2.0 + 0 \\&= 2.0 + 0 \\&= 2.0 \\&= 2.0\end{aligned}$$

$$0.0 + 0.0 - 1$$

$$0.0 + 0.0 - 1$$

$$0.0 = 1$$

$$\gamma_1 = 1$$

$$1.0 = 0$$

10.0 + 0.0 - 1

10.0 + 0.0 - 1

10.0 + 0.0 - 1

10.0 + 0.0 - 1

10.0 + 0.0 - 1

10.0 + 0.0 - 1

10.0 + 0.0 - 1

10.0 + 0.0 - 1

10.0 + 0.0 - 1

10.0 + 0.0 - 1

B. No. 2

$$\text{Q}(f_n) = n + n^2$$
$$\frac{1}{n} \cdot \frac{1}{n+2} + 2n + \frac{2}{n}$$
$$\frac{1}{n} + \frac{1}{n+2} + 2n$$
$$n, n \in \mathbb{N}$$

$$\text{I}) -2n + 2n^2 + 2$$
$$-2n + 2n^2$$
$$0 = 2n^2$$
$$2n^2 = 0$$
$$2n = 0$$
$$n = 0$$
$$n \in \mathbb{N}$$

$$\frac{n+2}{n}$$
$$\frac{0+2}{0}$$

$$-2n + 2n^2 + 2$$
$$-2n + 0^2 + 2$$
$$-2n = 2 - 0$$
$$-2n = 2$$
$$n = -1$$
$$n \in \mathbb{Z}$$

$$n = -1 - 1$$

$$n \in \mathbb{Z}$$

$$\text{II}) n + 3n = n$$
$$n + 3n = n$$
$$0 = n + 0$$
$$0 = 3n$$
$$0 = 3n$$
$$n = 0$$
$$n \in \mathbb{Z}$$

19.06.22

$$\begin{array}{l} 7x_1 + 3x_2 = 22 \\ 7x_1 + 3 \cdot 0 = 22 \end{array}$$

$$7x_2 + 0 = 22$$

$$7x_2 = 22 - 0$$

$$7x_2 = 22$$

$$x_2 = \underline{\underline{4}}$$

$$x_2 = 3,14$$

$$(1,5) \quad -2x_1 + 2x_2 = 3$$

$$7x_1 + 3x_2 = 22$$

$$7x_1 + 3 \cdot 4 = 22$$

$$7x_1 = 22 - 12$$

$$7x_1 = 10$$

$$x_1 = \underline{\underline{1,43}}$$

$$+3x_1 - 3x_2 = -4,5$$

$$7x_1 + 3x_2 = 22$$

$$10x_1 = 17,5$$

$$x_1 = \underline{\underline{1,75}}$$

$$\frac{10}{10}$$

$$x_1 = \underline{\underline{1,75}}$$

$$3,14$$

$$+1$$

$$2,00$$

$$1,75$$

$$10,00$$

$$14,00$$

$$2,00$$

$$35,000$$

$$7,00$$

$$1,75$$

$$35,00$$

$$49,00$$

$$7,00$$

$$17,2500$$

$$7,00$$

$$22,50$$

$$12,15$$

$$0,9750$$

$$1,38$$

$$0,6$$

$$15$$

$$15$$

$$0$$

$$\begin{cases} 7x_1 + 3x_2 = 22 \\ x_1 = 1,75 \end{cases}$$

$$\begin{cases} 7x_1 + 3x_2 = 22 \\ x_1 = 1,75 \end{cases}$$

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$$\begin{cases} 7x_1 + 3x_2 = 22 \\ x_1 = 1,75 \end{cases}$$

$$\begin{cases} z = 4,66 \\ x_1 = ? \\ x_2 = ? \end{cases}$$

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$$\begin{cases} z = 4,57 \\ x_1 = ? \\ x_2 = ? \end{cases}$$

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$$\begin{cases} z = 4,57 \\ x_1 = ? \\ x_2 = ? \end{cases}$$

$$\begin{cases} z = 3,33 \\ x_1 = ? \\ x_2 = ? \end{cases}$$

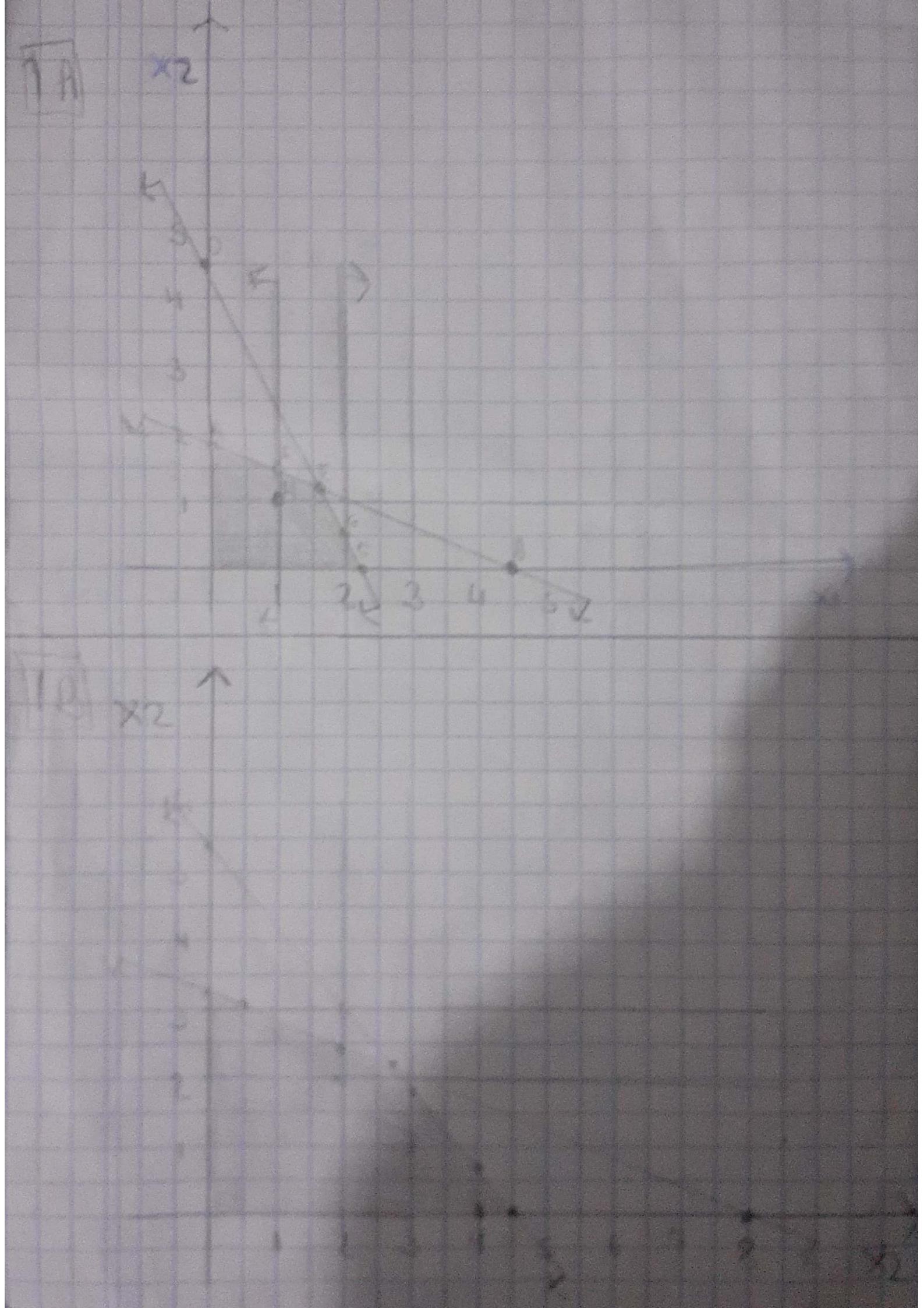
$$\begin{cases} z = 3,33 \\ x_1 = ? \\ x_2 = ? \end{cases}$$

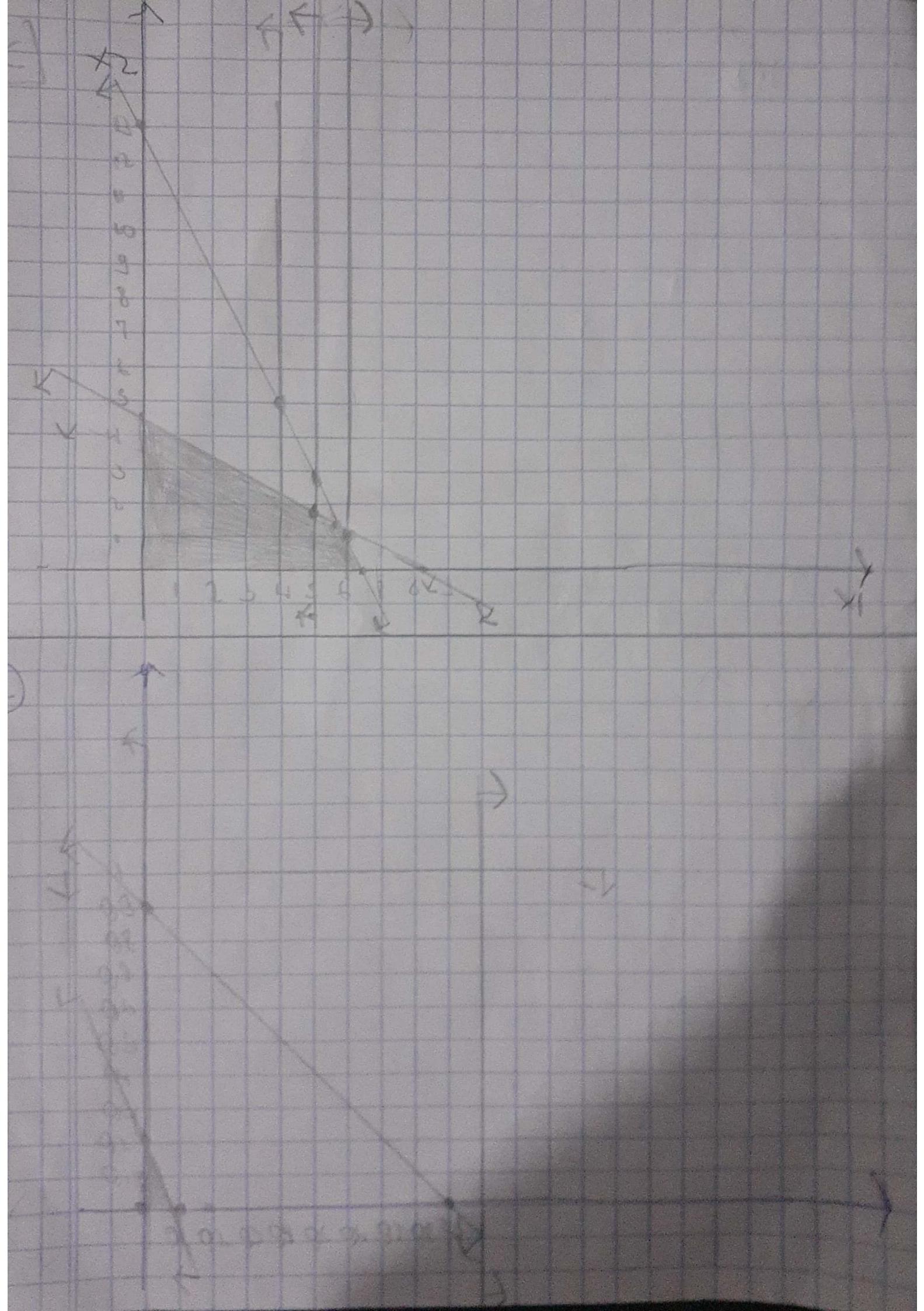
$$\begin{cases} z = 3,33 \\ x_1 = ? \\ x_2 = ? \end{cases}$$

$$\begin{cases} z = 3,33 \\ x_1 = ? \\ x_2 = ? \end{cases}$$

$$\begin{cases} z = 3,33 \\ x_1 = ? \\ x_2 = ? \end{cases}$$

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(3)

