

⑥

$x_1 = \#$ boxes draft seen
 $x_2 = \#$ " dart "

sell max. 100 boxes:

1h \rightarrow 10 box draft

2h \rightarrow 10 box dart

operation time ≤ 14 h

$$x_1 + x_2 \leq 100$$

$$x_1 \geq 0$$

$$x_2 \geq 0$$

$$\frac{x_1}{10} + \frac{2x_2}{10} \leq 14$$

$$0.1x_1 + 0.2x_2 \leq 14$$

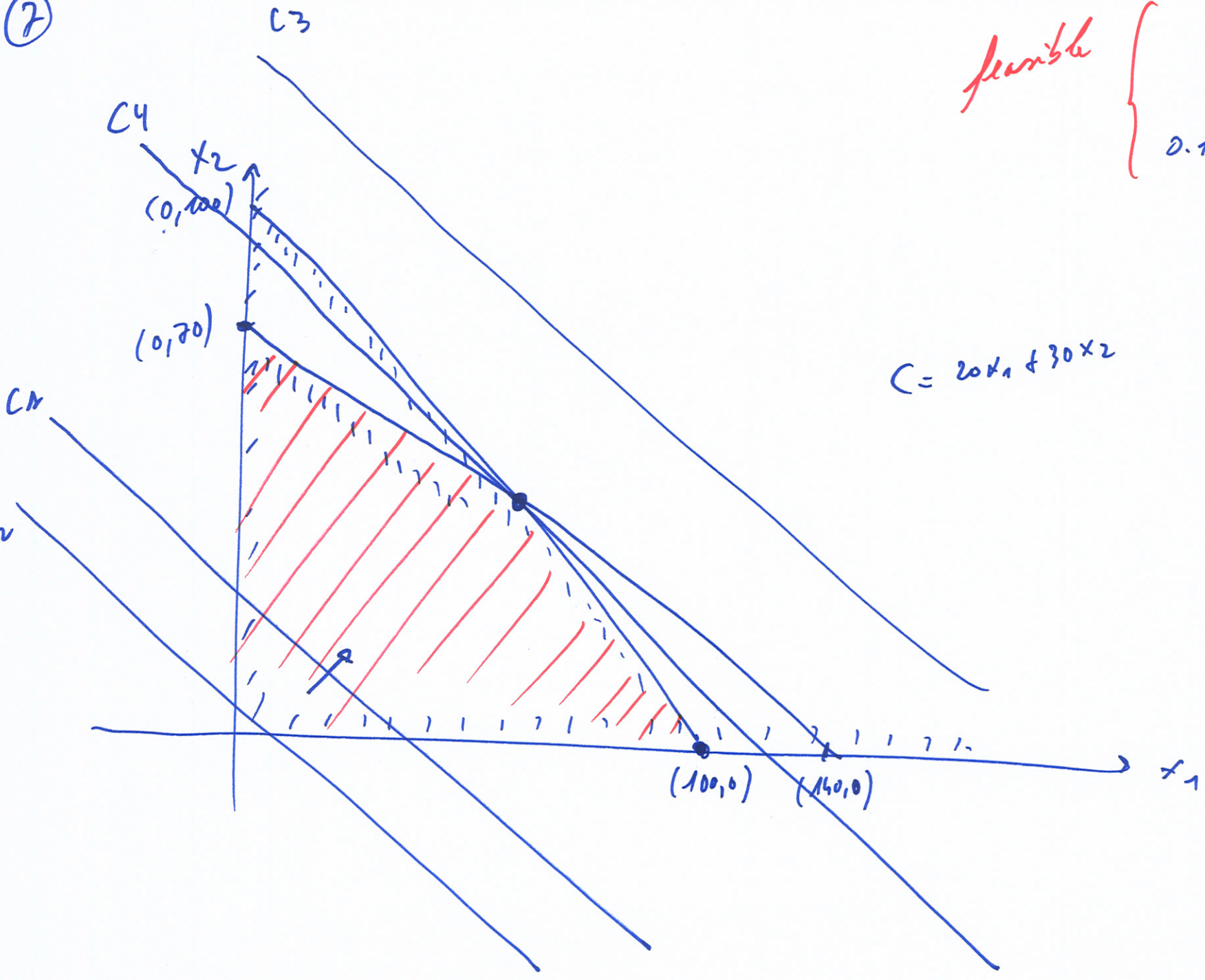
$$x_1 + 2x_2 \leq 140$$

1 draft : 20 \$
1 dart : 30 \$

$$\begin{array}{l} \max_{x_1, x_2} \quad 20x_1 + 30x_2 \\ x_1 + x_2 \leq 100 \\ 0.1x_1 + 0.2x_2 \leq 14 \\ x_1, x_2 \geq 0 \end{array}$$

linear
programming
problem

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feasible

$$\begin{cases} x_1, x_2 \geq 0 \\ x_1 + x_2 \leq 100 \\ 0.1x_1 + 0.2x_2 \leq 14 \end{cases}$$

$$C = 20x_1 + 30x_2$$

x_2
 $(0, 100)$

$(0, 70)$

$(100, 0)$

$(140, 0)$

x_1

C_1

C_2

C_4

C_3

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$$\begin{array}{l} \text{max} \\ \text{Rate} \end{array} \quad 20x_1 + 30x_2$$

$$\rightarrow \begin{array}{l} \text{min} \\ \text{Rate} \end{array} \quad -20x_1 - 30x_2$$

$$x_1 + x_2 \leq 100$$

$$x_1, x_2 \geq 0$$

$$0.1x_1 + 0.2x_2 \leq 14$$

$$x_1 + x_2 + \lambda_1 = 100$$

$$= 100$$

$$\lambda_1 \geq 0$$

$$0.1x_1 + 0.2x_2 + \lambda_2 = 14$$

$$\lambda_2 = 14$$

$$\lambda_2 \geq 0$$

$$A x = b$$

$$\begin{bmatrix} 1 & 1 & 0 & 0 \\ 0.1 & 0.2 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} x_1 \\ x_2 \\ \lambda_1 \\ \lambda_2 \end{bmatrix}$$

$$\begin{bmatrix} 100 \\ 14 \end{bmatrix}$$

$$\begin{array}{l} \text{min } c^T x \\ * \\ Ax = b \\ x \geq 0 \end{array}$$

⑨

$$x + 2y = 7$$

$$x, y \in \mathbb{R}$$

\downarrow x^+

\downarrow x^-

$$x = x^+ - x^-$$

$$x^+, x^- \geq 0$$

$$2 = 2 - 0$$

$$y = y^+ - y^-$$

$$y^+, y^- \geq 0$$

$$-5 = 0 - 5$$

$$x^+ - x^- + 2y^+ - 2y^- = 7$$

$$Ax = b$$

$$x \geq 0$$

A

~~x~~

= b

$$[1 \quad -1 \quad 2 \quad -2]$$

$$\begin{bmatrix} x^+ \\ x^- \\ y^+ \\ y^- \end{bmatrix}$$

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