Øving 10

Opg. 2: Løs følgende MP-modell grafisk

a)

$$\max z = 3x_1 + 6x_2, \quad \text{(målfunksjon)} \quad (1)$$

$$3x_1 + 2x_2 \leq 18, \quad (2)$$

$$x_1 + x_2 \leq 15, \quad (3)$$

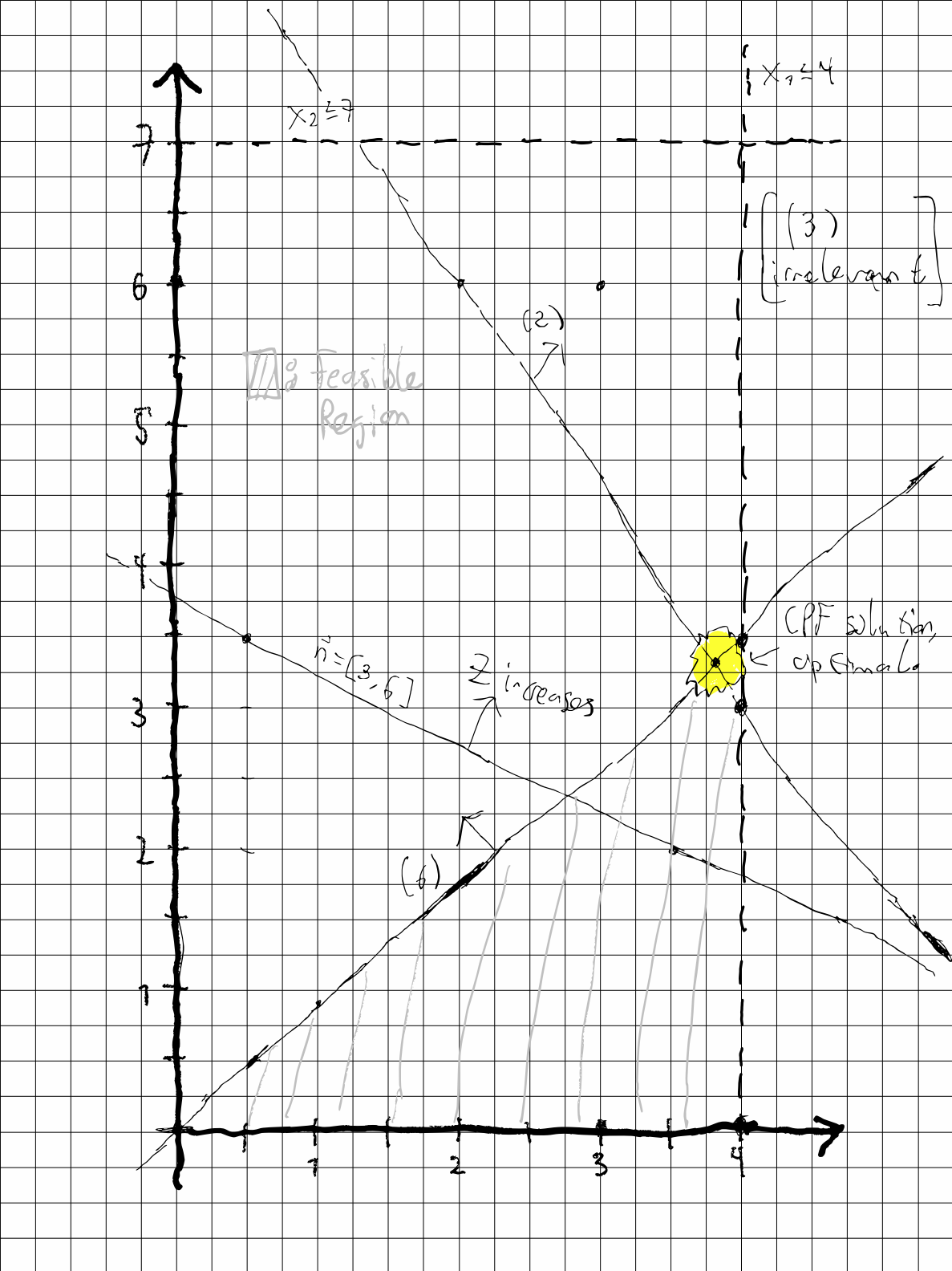
$$x_1 \leq 4, \quad (4)$$

$$x_2 \leq 7 \quad (5)$$

$$-7x_1 + 8x_2 \leq 0 \quad (6)$$

$$x_1, x_2 \geq 0. \quad (7)$$

$$c = \begin{bmatrix} 3 \\ 6 \end{bmatrix}, \quad A_{ub} = \begin{bmatrix} 3 & 2 \\ 1 & 1 \\ 1 & 0 \\ 0 & 1 \\ -7 & 8 \end{bmatrix}, \quad b_{ub} = \begin{bmatrix} 18 \\ 15 \\ 4 \\ 7 \\ 0 \end{bmatrix}.$$


$x_2 \leq 7$
$x_1 \leq 4$
(3)
irrelevant
(2)
Feasible Region
CPF solution, optimal
$\vec{n} = [3, 6]$
Z increases
(1)
7
6
5
4
3
2
1
1
2
3
4

b) The optimal solution is at the intersection of constraint (2) and (6).

$$3x_1 + 2x_2 = 18$$
$$-7x_1 + 8x_2 = 0$$

$$Ax = b, \quad \begin{bmatrix} 3 & 2 \\ -7 & 8 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 18 \\ 0 \end{bmatrix}.$$

$$\left[\begin{array}{cc|c} 1 & 2/3 & 6 \\ -7 & 8 & 0 \end{array}\right] \sim \left[\begin{array}{cc|c} 1 & 2/3 & 6 \\ 0 & 38/3 & 42 \end{array}\right]$$

$$\sim \left[\begin{array}{cc|c} 1 & 2/3 & 6 \\ 0 & 1 & 63/19 \end{array}\right] \sim \left[\begin{array}{cc|c} 1 & 0 & 72/19 \\ 0 & 1 & 63/19 \end{array}\right].$$

Thus, $\begin{bmatrix} x_1^* \\ x_2^* \end{bmatrix} = \begin{bmatrix} 72/19 \\ 63/19 \end{bmatrix} \simeq \begin{bmatrix} 3.79 \\ 3.32 \end{bmatrix}$, $Z_{opt}^* = \frac{594}{19} \simeq 31.263$.

Oppgave 3

a)

Linear programming model:

$x = [x_1, x_2, x_3]^T$.

$\min Z = \Pi^T x$ s.t.

$2x_1 + 1x_2 + \frac{1}{2}x_3 \geq 400$, [\$ Million]

$\frac{1}{2}x_1 + \frac{1}{2}x_2 + 1x_3 \geq 100$,

$0x_1 + \frac{3}{2}x_2 + 2x_3 \geq 300$.