PROBLEMA DE MAXIMIZACIÓN

En un taller metalúrgico se fabrican dos tipos de piezas A y B, que deben seguir los siguientes procesos:

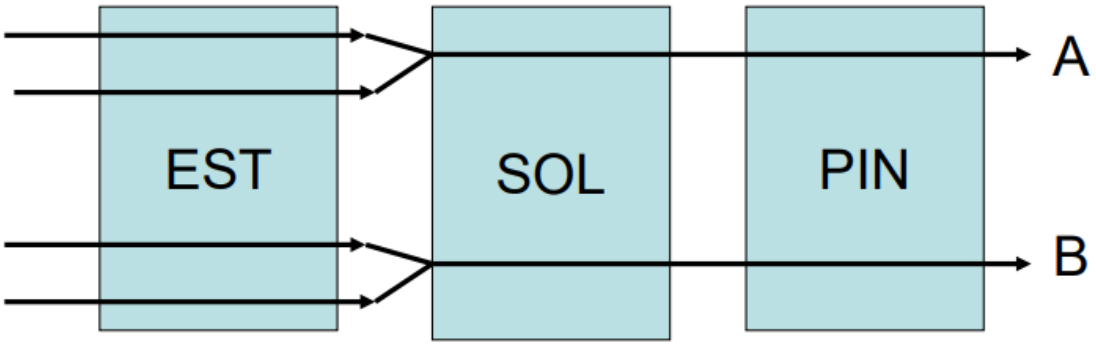
1. Estampado en hojas metálicas
2. Soldado
3. Pintado

La operación de estampado consiste en preparar partes idénticas que luego serán soldadas de a pares, formando la pieza A. El mismo proceso se realiza para la pieza B.

La utilidad unitaria es de $ 4 para la pieza A y $ 3 para la pieza B. Se desea establecer el programa semanal de producción que maximice la utilidad del taller con respecto a las piezas consideradas.

Los insumos de equipos son los siguientes, para la realización de cada una de las operaciones (expresados en segundos por pieza):

Operación	A	B	Tiempo disponible (seg./semana)
Estampado de c/parte	3	8	48.000
Soldado	12	6	42.000
Pintado	9	9	36.000



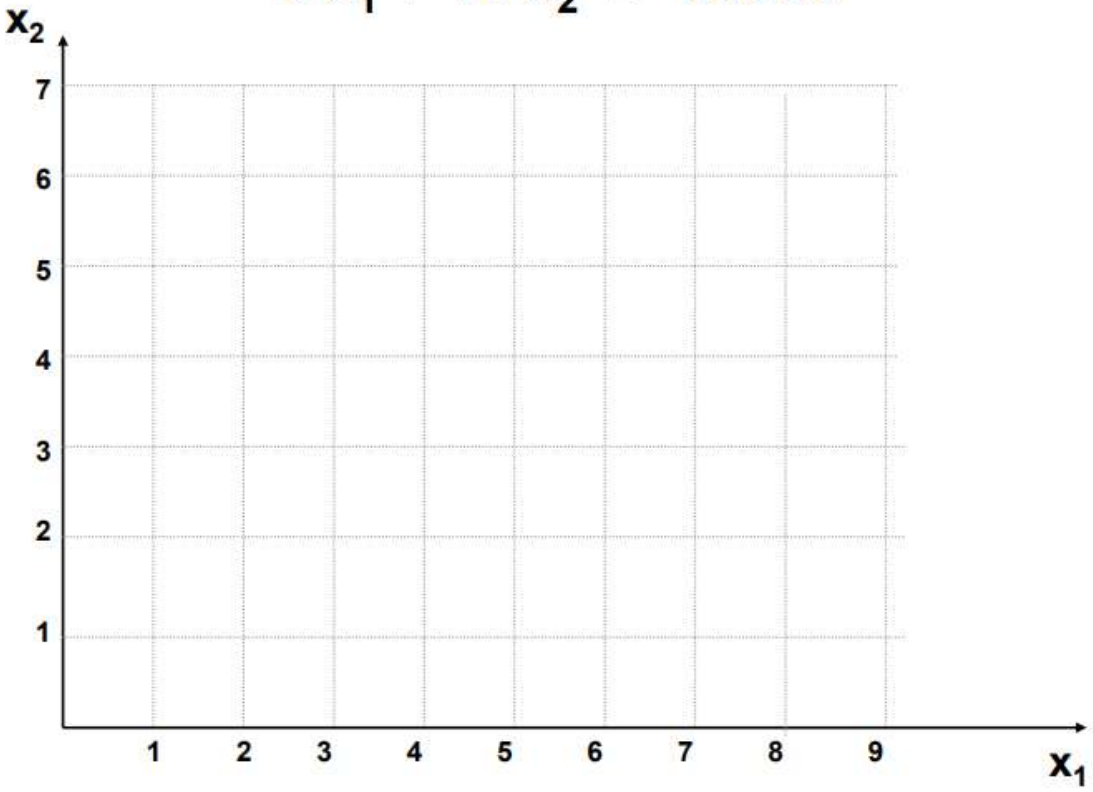
MAX: $Z = 4\,x_1 + 3\,x_2$

Sujeto a:

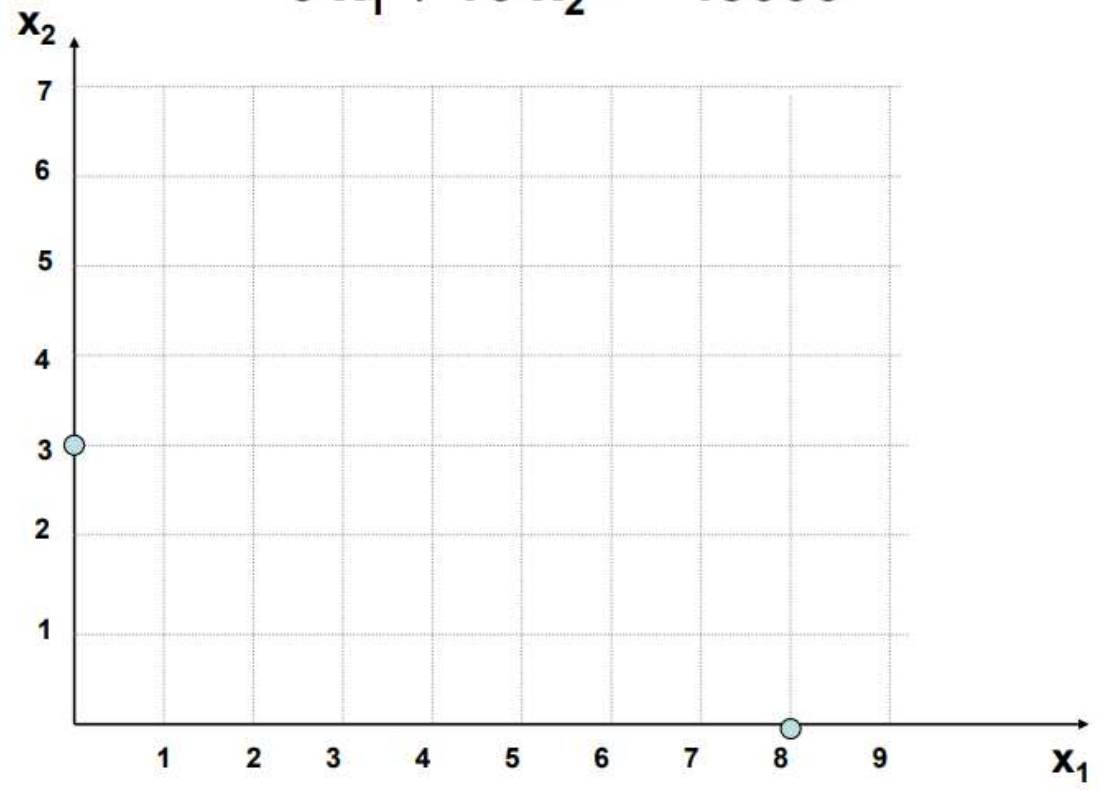
$$\begin{cases} 6\,x_1 + 16\,x_2 \leq 48000 \\ 12\,x_1 + 6\,x_2 \leq 42000 \\ 9\,x_1 + 9\,x_2 \leq 36000 \end{cases}$$

siendo: $x_1, x_2 \geq 0$ **y continuas**

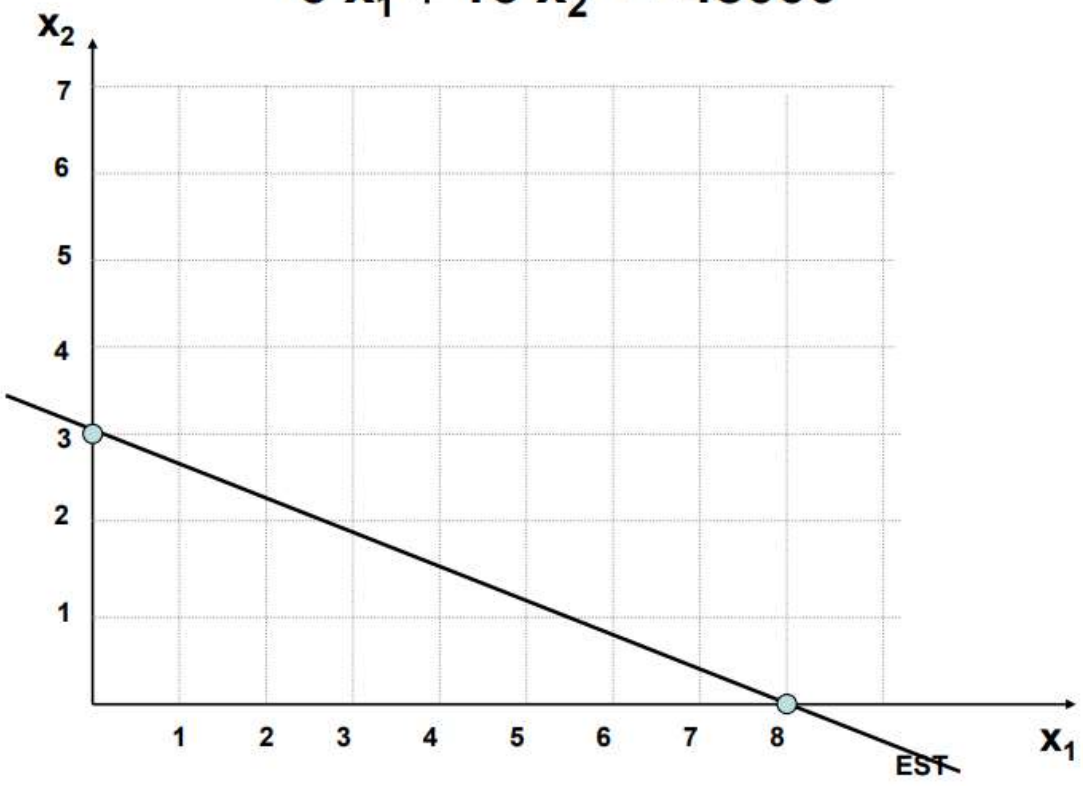
$$6\,x_1 + 16\,x_2 \leq 48000$$



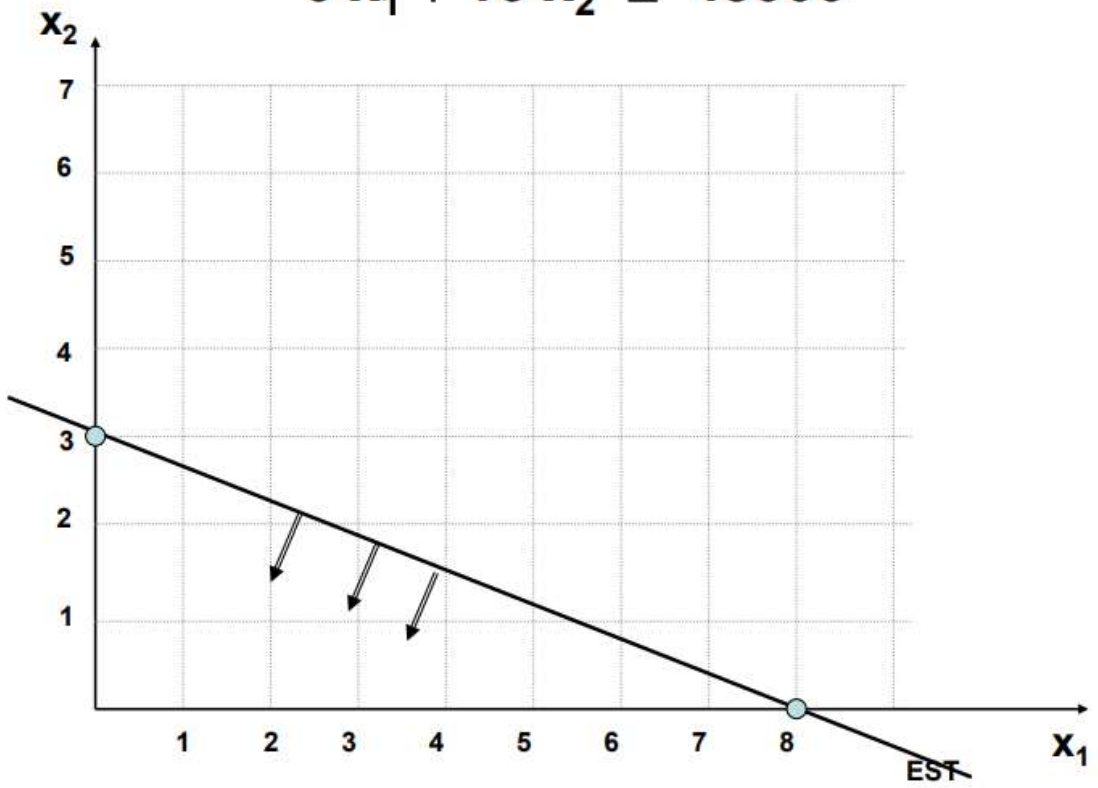
$$6\,x_1 + 16\,x_2 = 48000$$



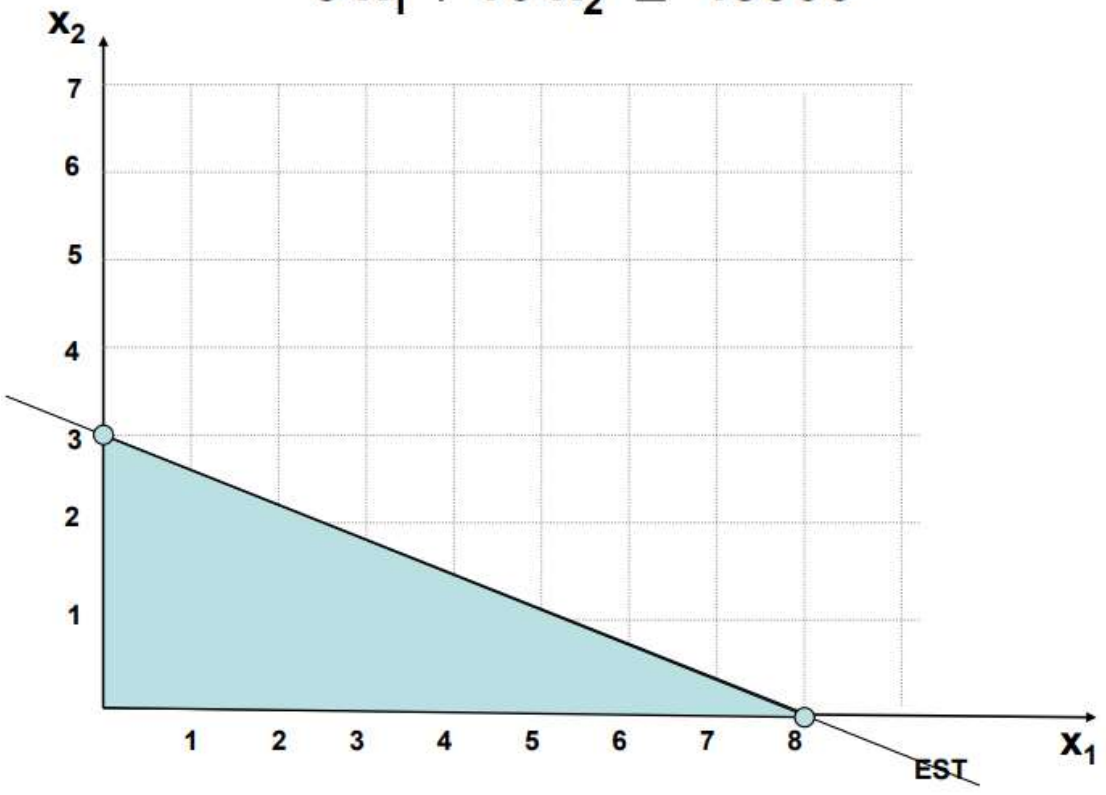
$$6\,x_1 + 16\,x_2 = 48000$$

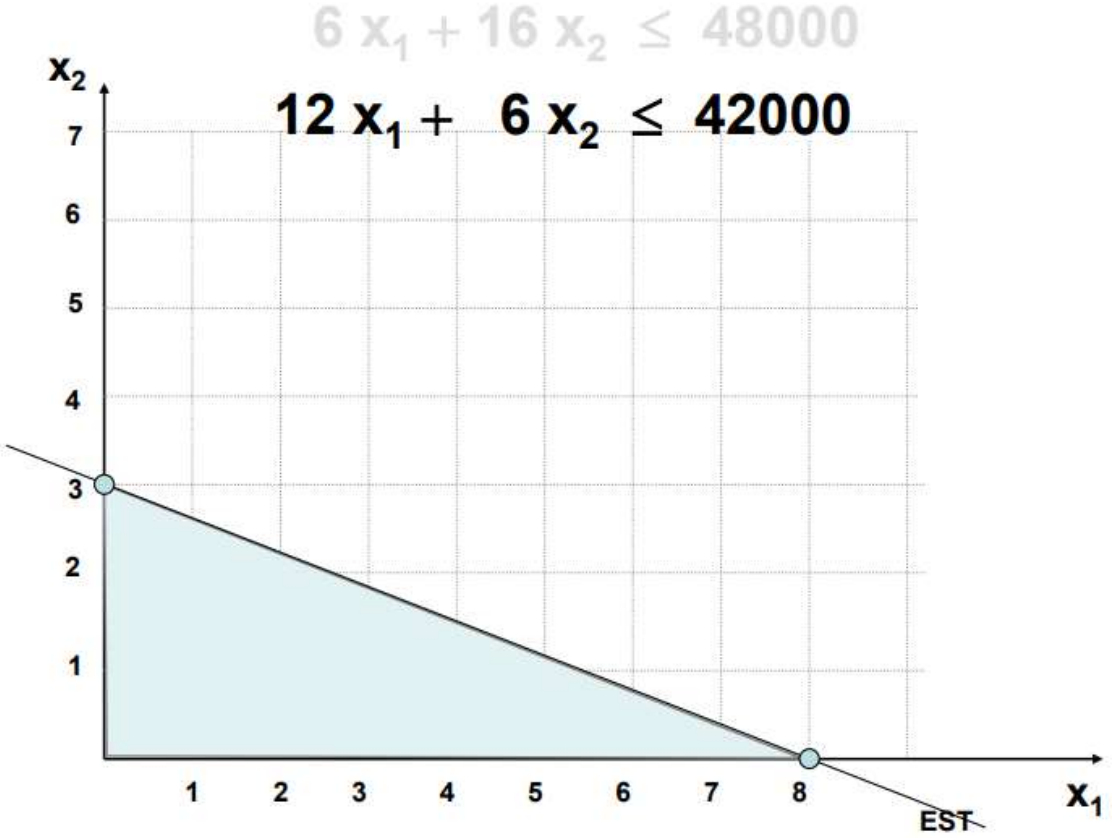


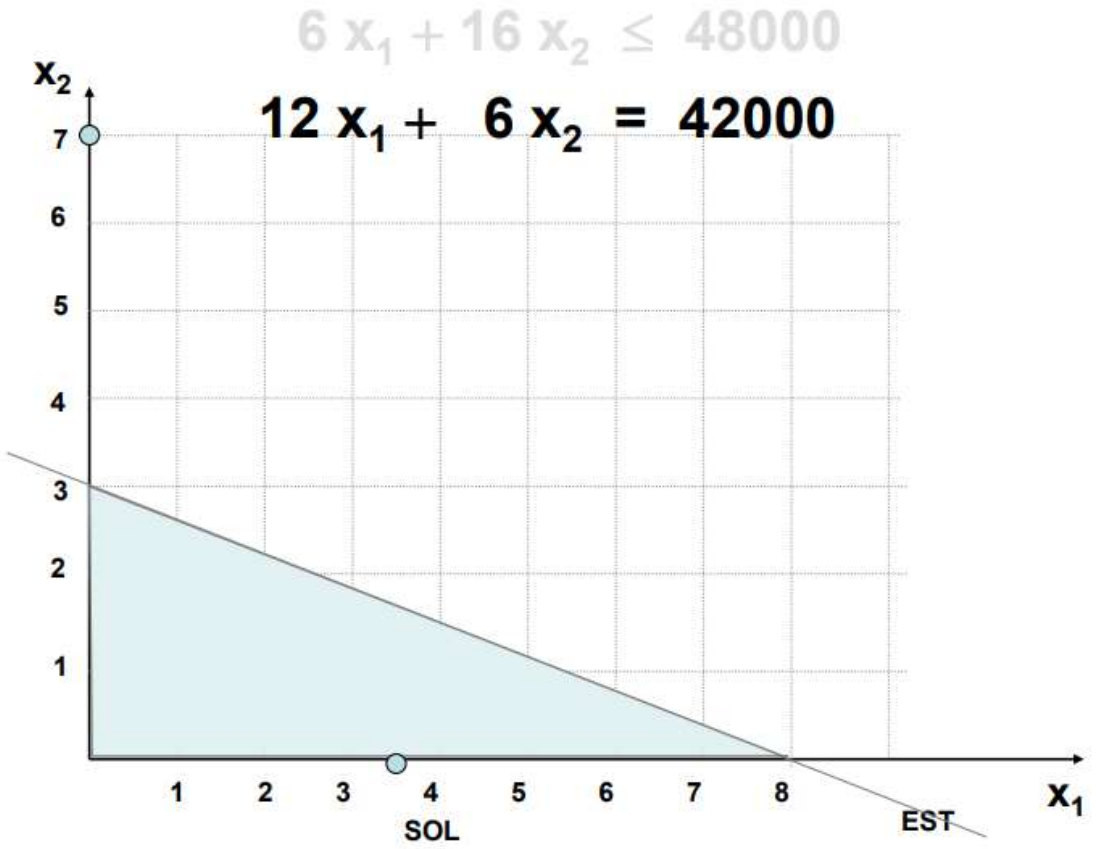
$$6\,x_1 + 16\,x_2 \leq 48000$$



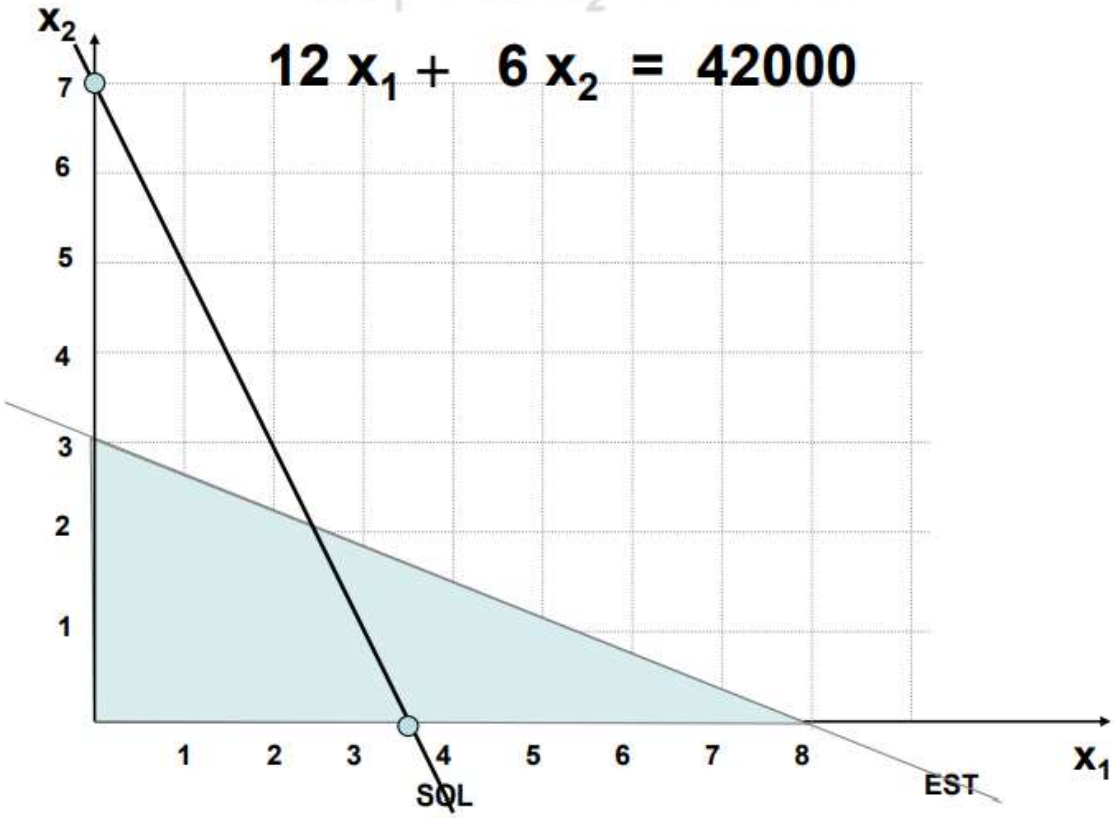
$$6\,x_1 + 16\,x_2 \leq 48000$$



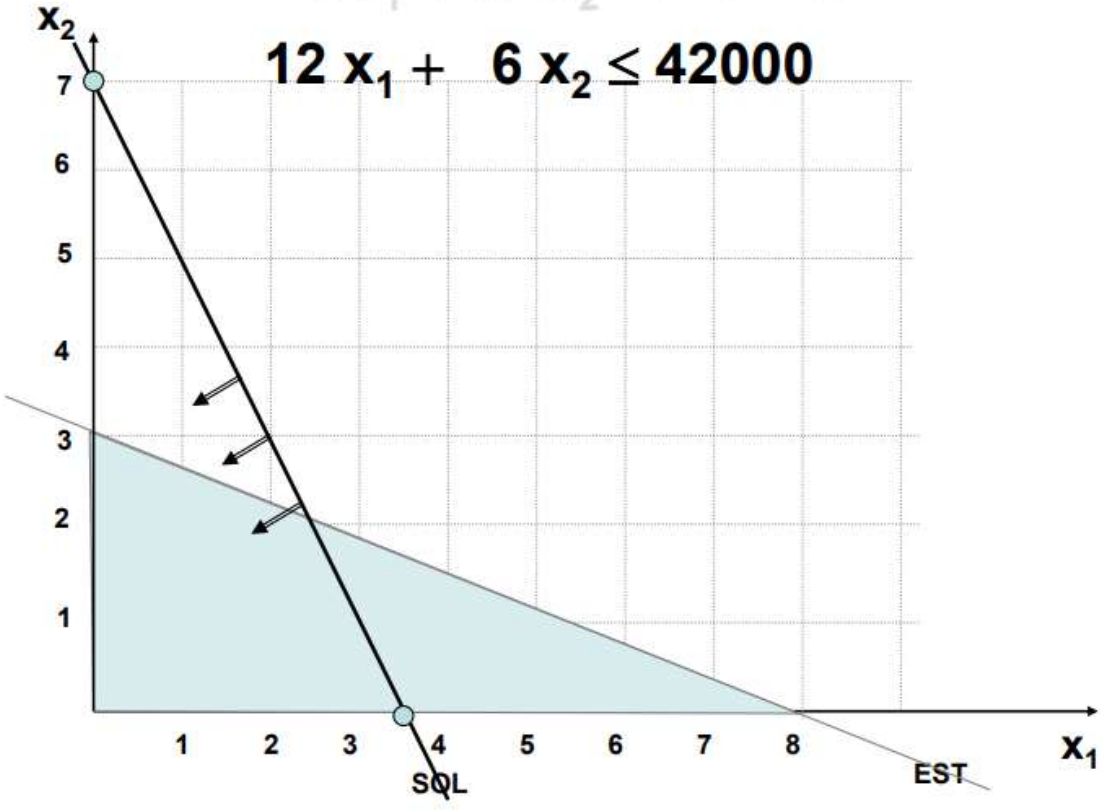

6 x1 + 16 x2 ≤ 48000
12 x1 + 6 x2 ≤ 42000
x2
7
6
5
4
3
2
1
1
2
3
4
5
6
7
8
x1
EST


6 x1 + 16 x2 ≤ 48000
12 x1 + 6 x2 = 42000
x2
7
6
5
4
3
2
1
1
2
3
4
5
6
7
8
x1
SOL
EST

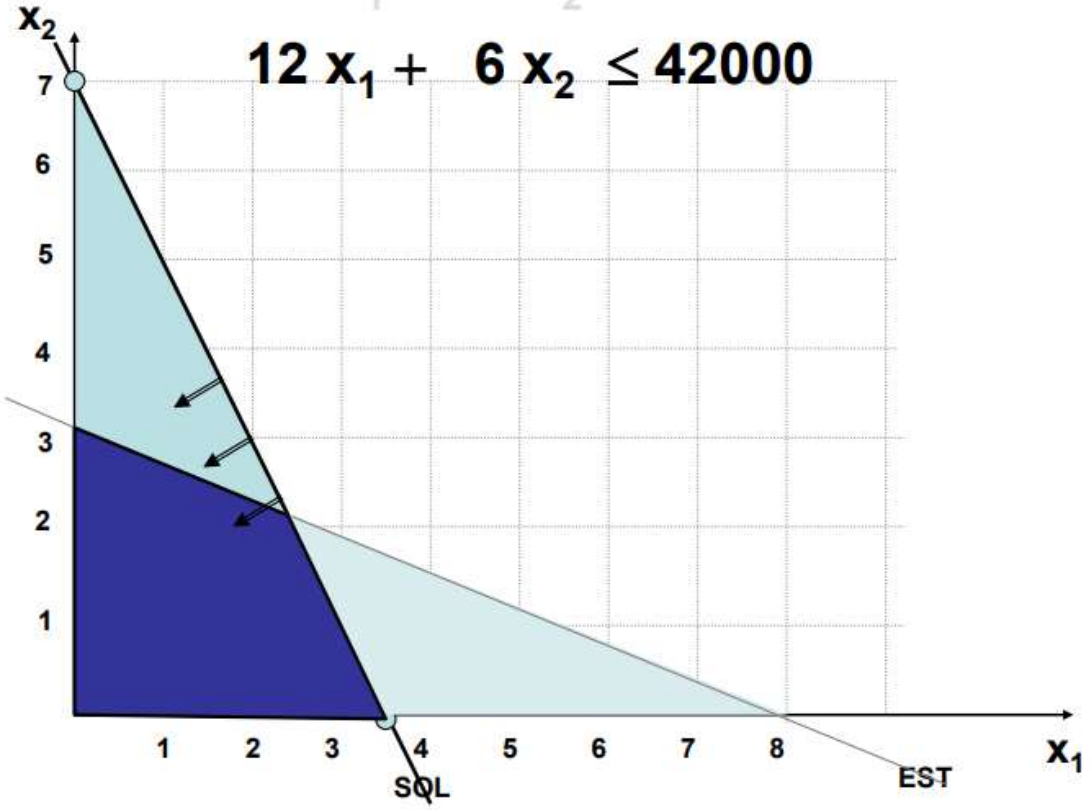
$6\,x_1 + 16\,x_2 \leq 48000$



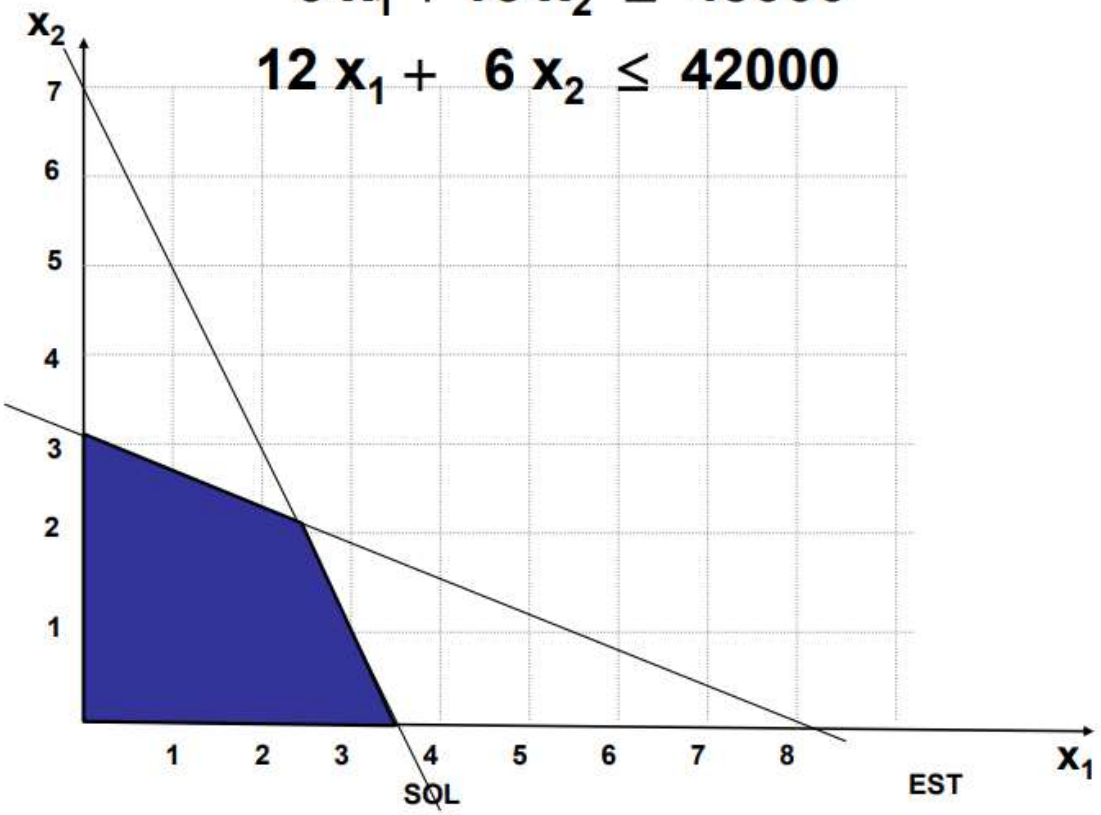
$6\,x_1 + 16\,x_2 \leq 48000$

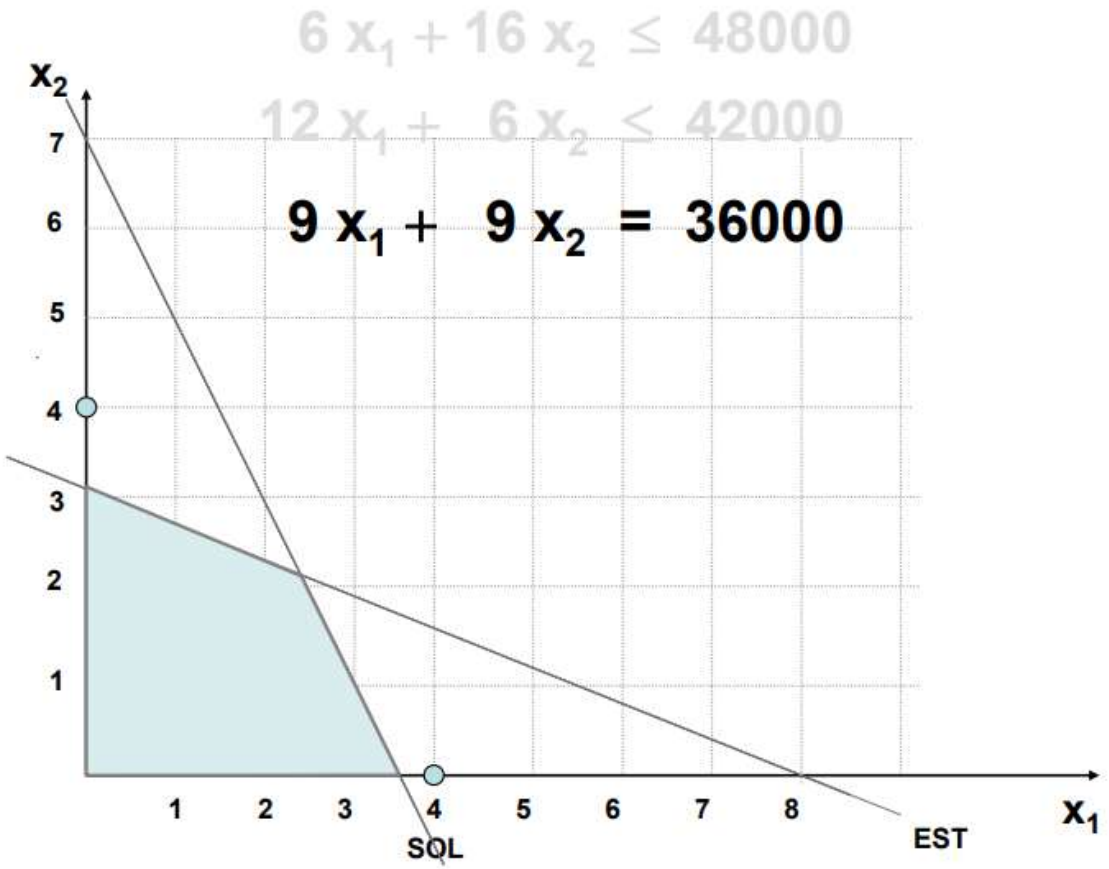


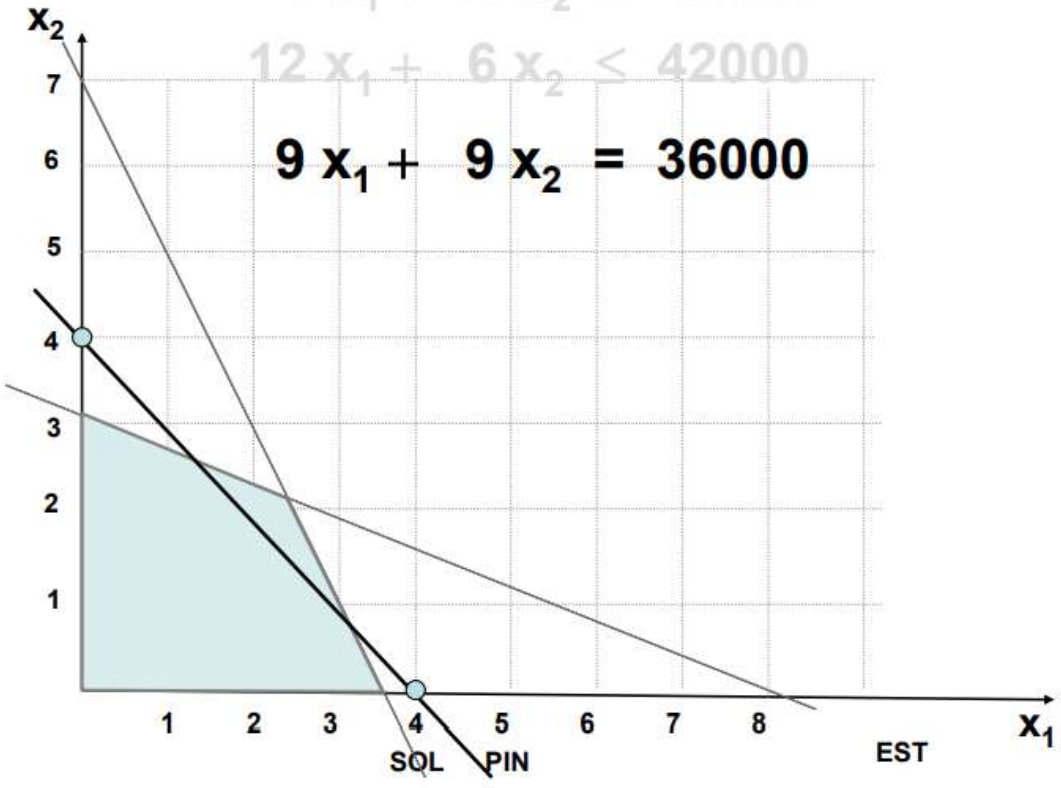
$6\,x_1 + 16\,x_2 \leq 48000$

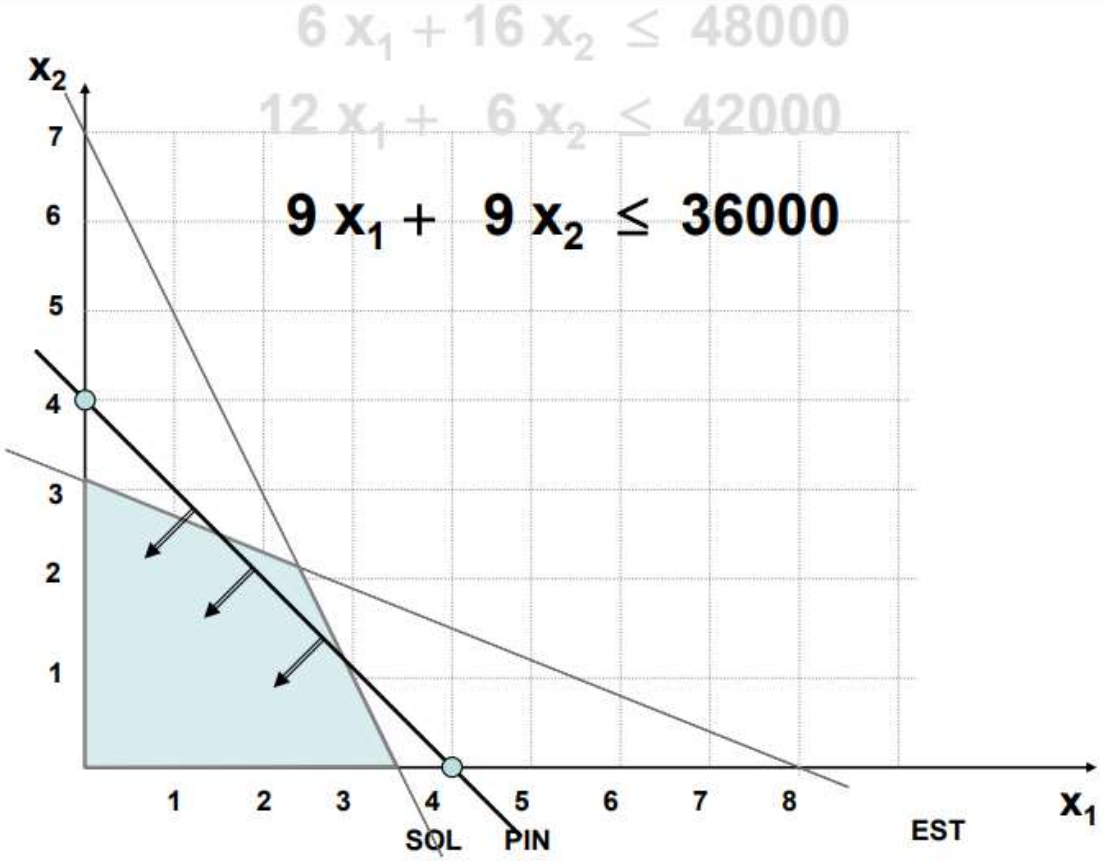


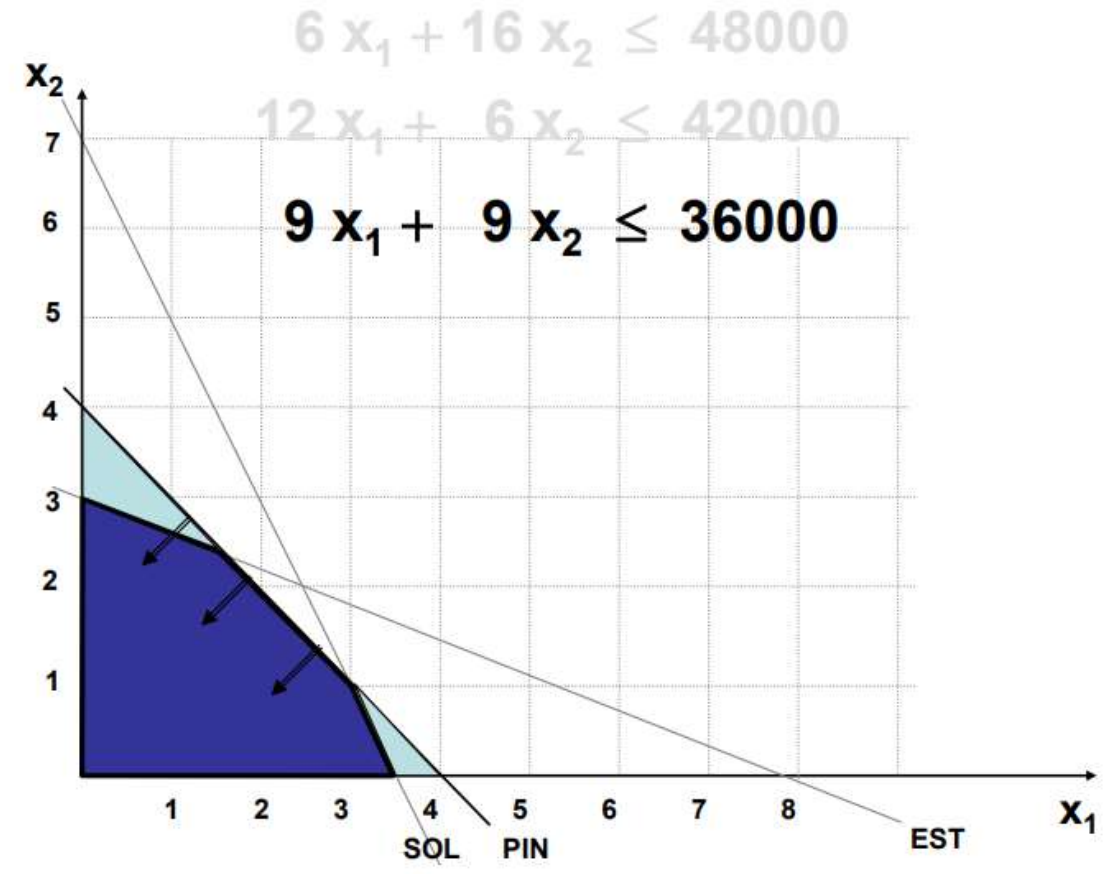
$6\,x_1 + 16\,x_2 \leq 48000$



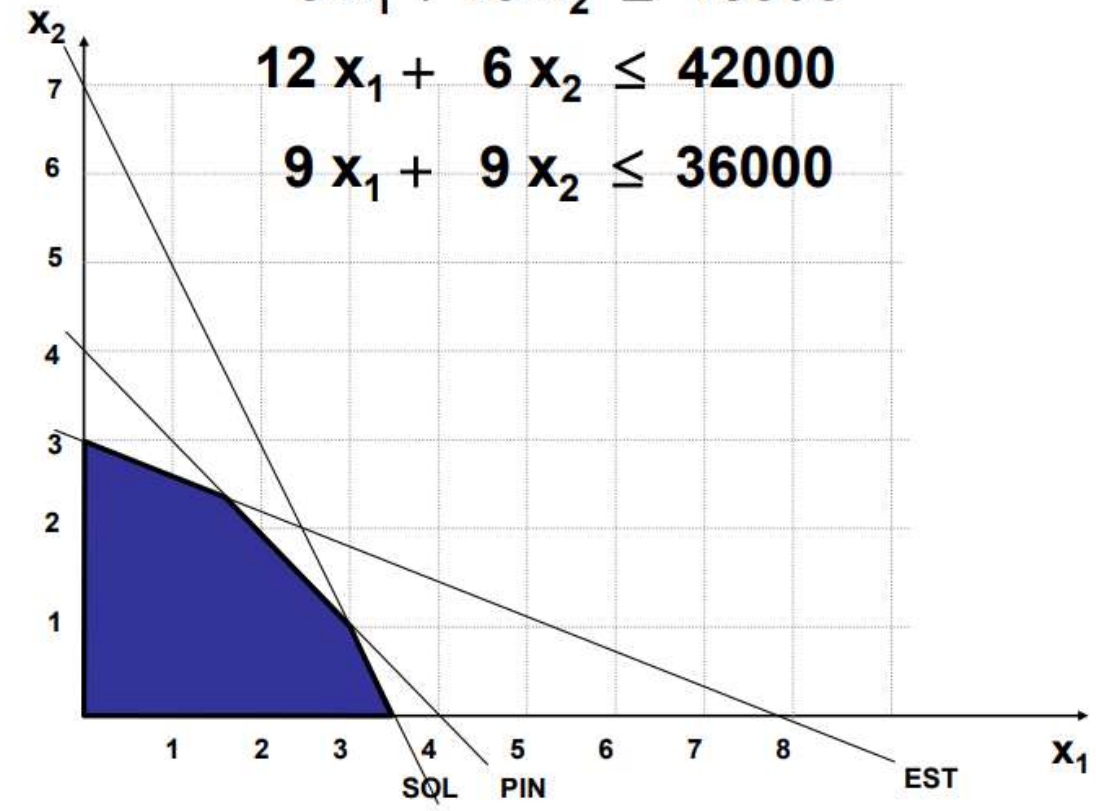

6 x1 + 16 x2 ≤ 48000
12 x1 + 6 x2 ≤ 42000
9 x1 + 9 x2 = 36000
x2
x1
SOL
EST

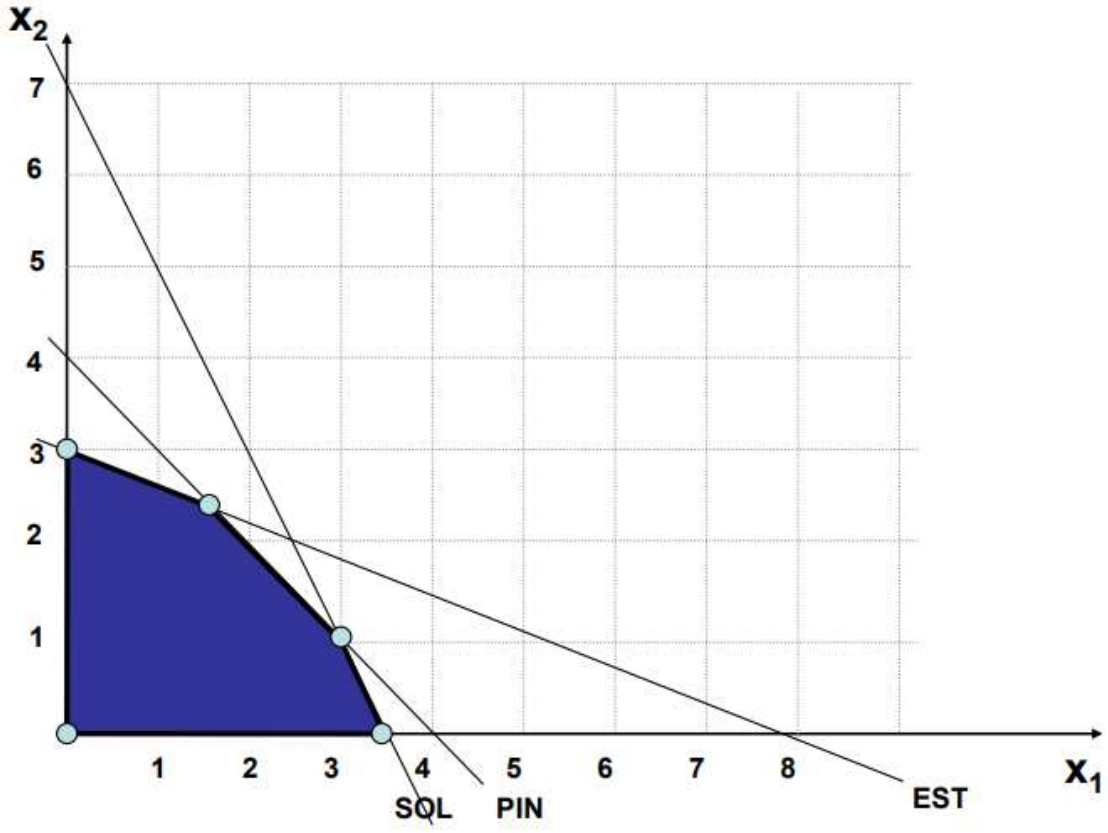

6 x1 + 16 x2 ≤ 48000
12 x1 + 6 x2 ≤ 42000
9 x1 + 9 x2 = 36000
x2
x1
SOL
PIN
EST

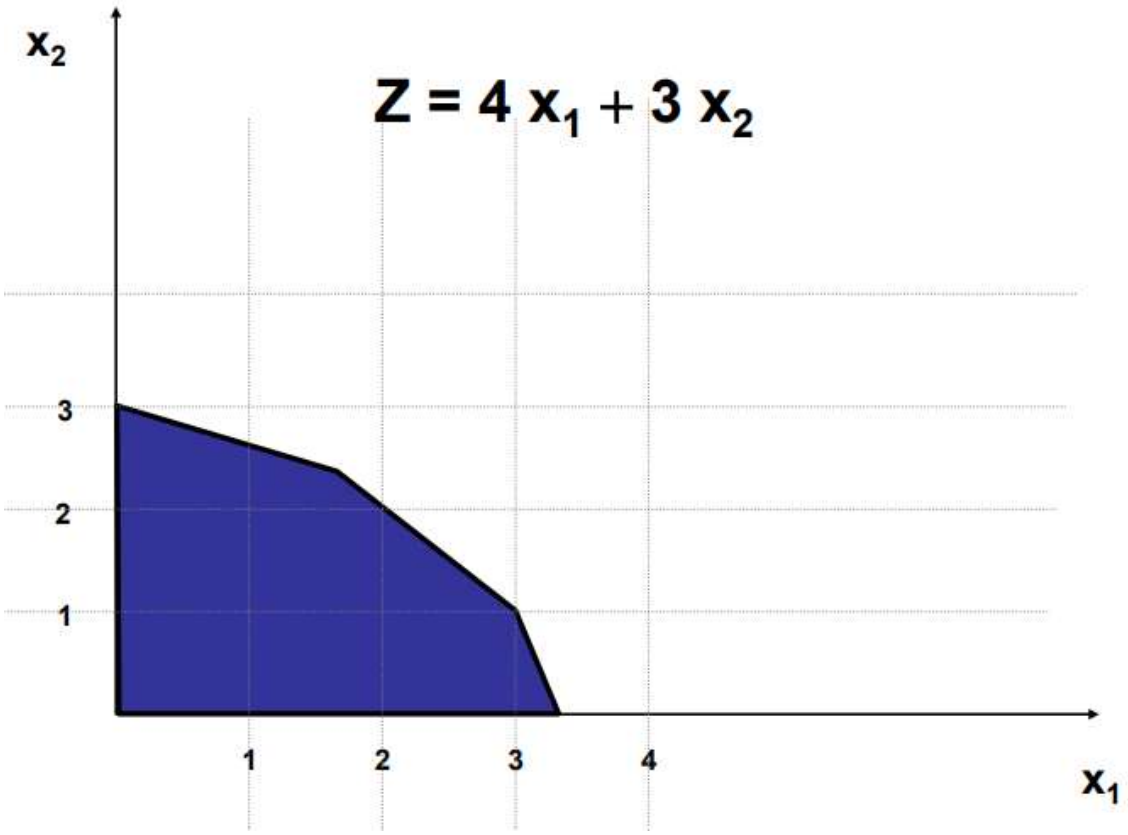

6 x1 + 16 x2 ≤ 48000
12 x1 + 6 x2 ≤ 42000
9 x1 + 9 x2 ≤ 36000
x2
x1
1
2
3
4
5
6
7
8
SOL
PIN
EST

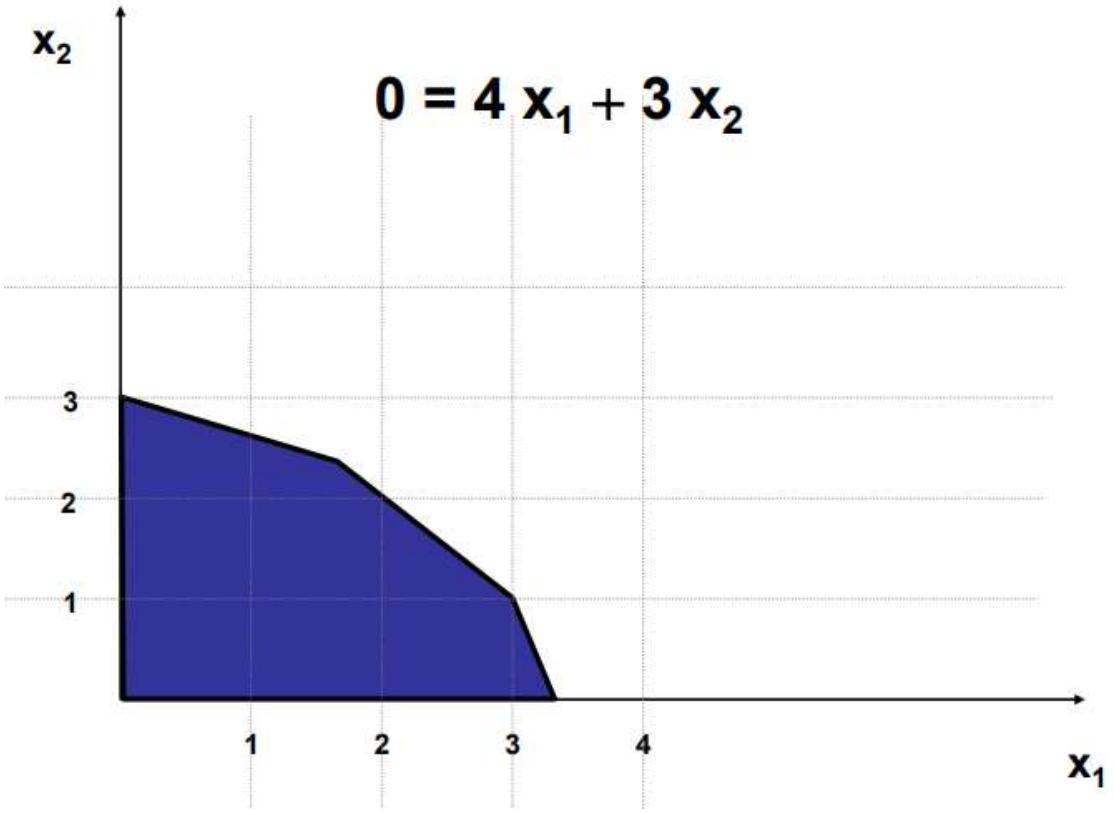

6 x1 + 16 x2 ≤ 48000
12 x1 + 6 x2 ≤ 42000
9 x1 + 9 x2 ≤ 36000
x2
x1
1
2
3
4
5
6
7
8
SOL
PIN
EST

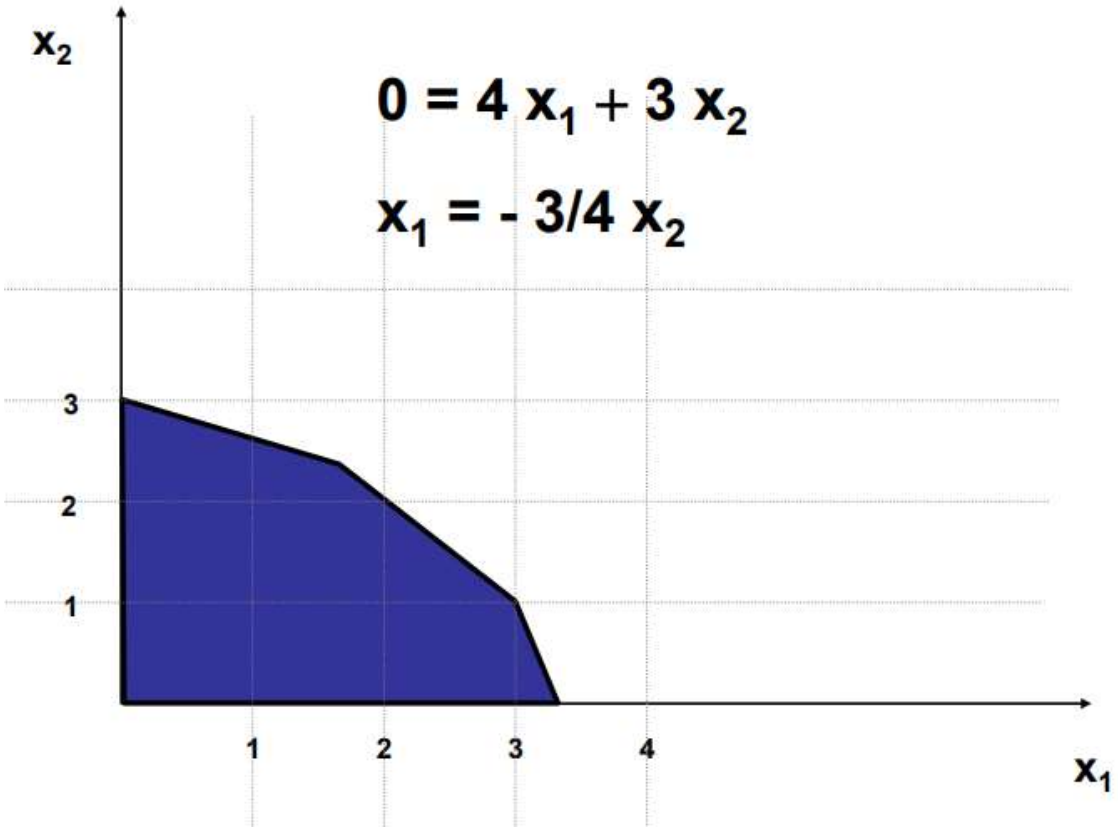
$$6x_1 + 16x_2 \leq 48000$$
$$12x_1 + 6x_2 \leq 42000$$
$$9x_1 + 9x_2 \leq 36000$$

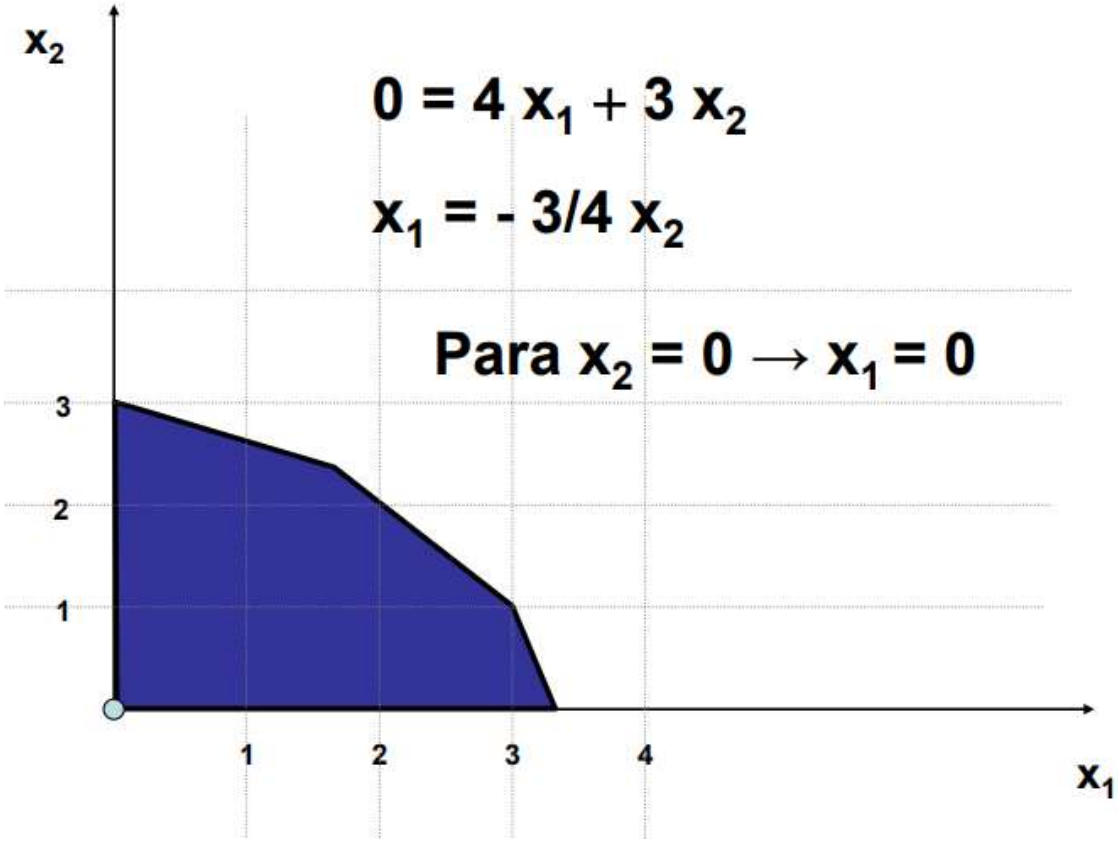


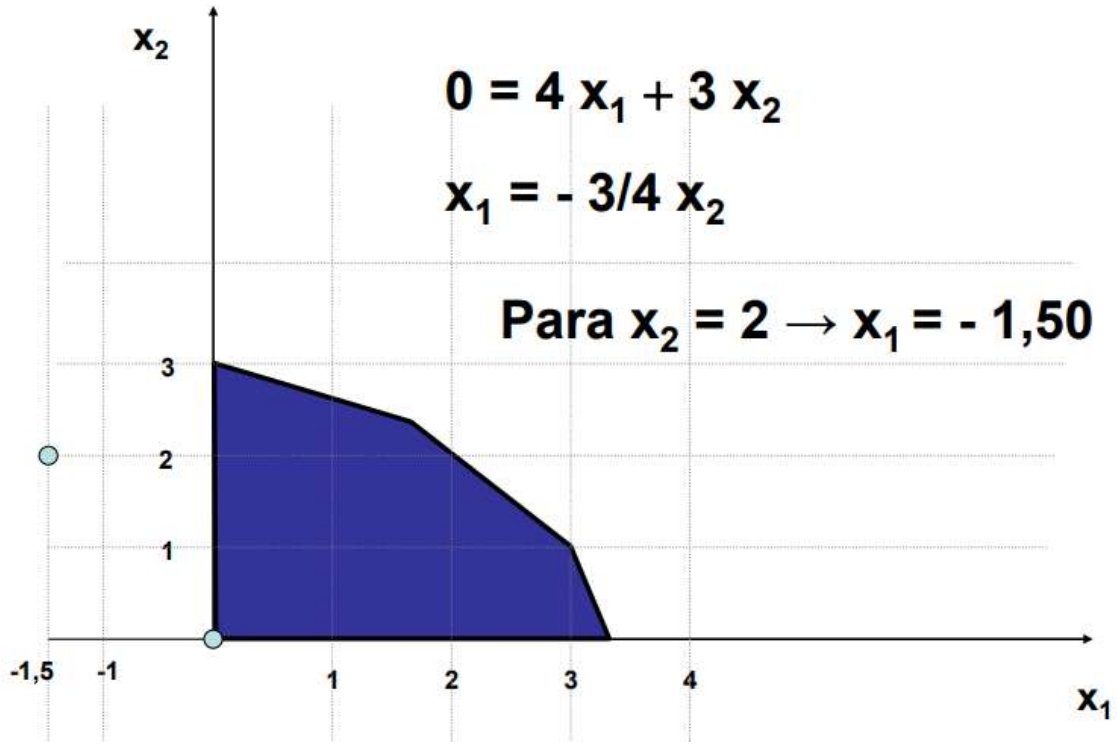


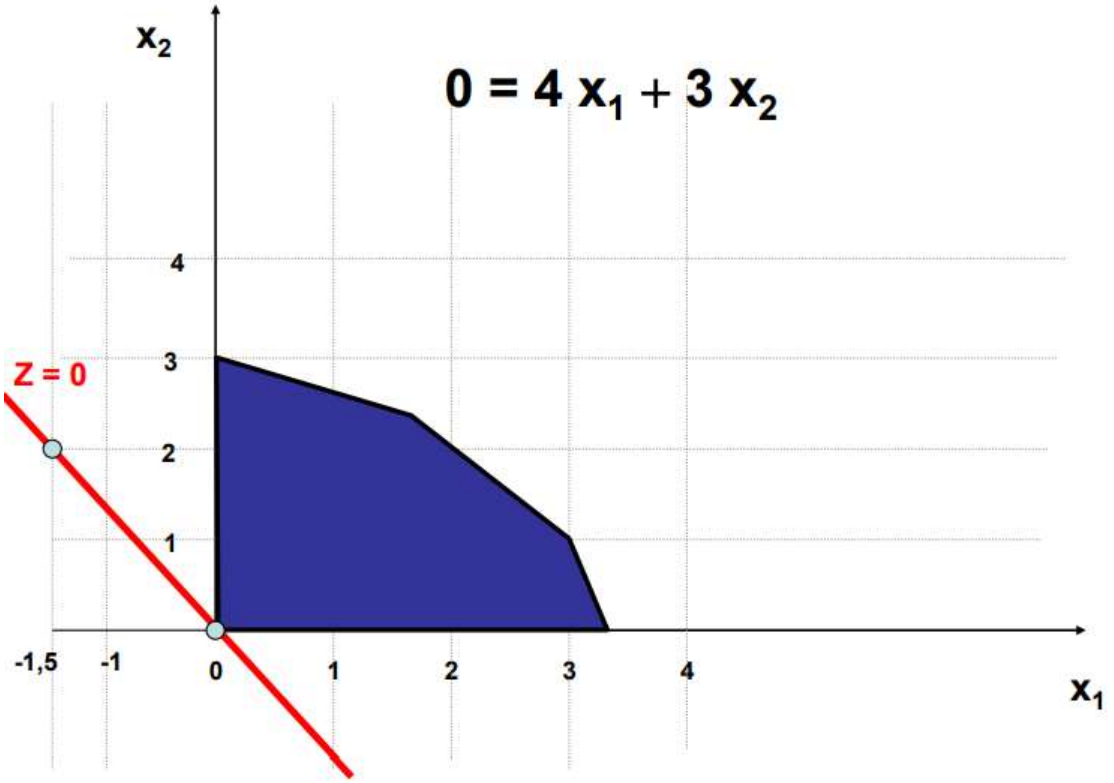

x_2
$Z = 4\,x_1 + 3\,x_2$
3
2
1
1
2
3
4
x_1

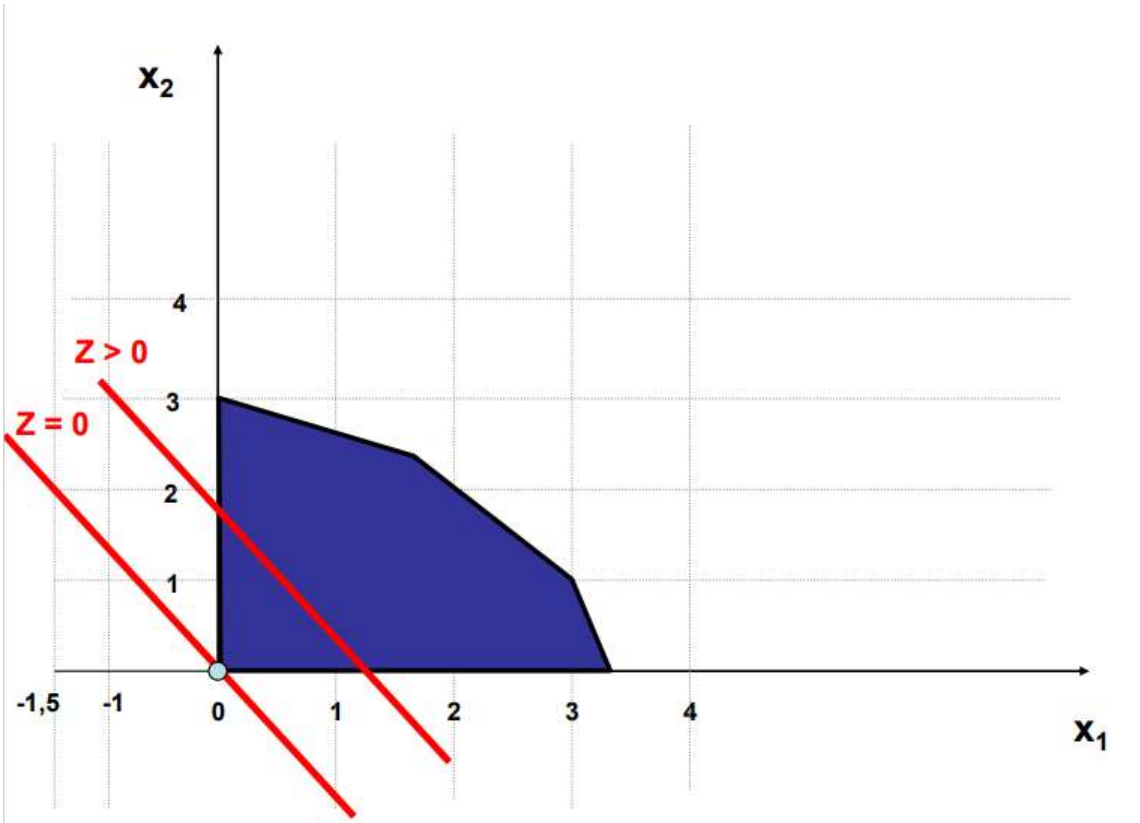

x_2
$0 = 4\,x_1 + 3\,x_2$
3
2
1
1
2
3
4
x_1

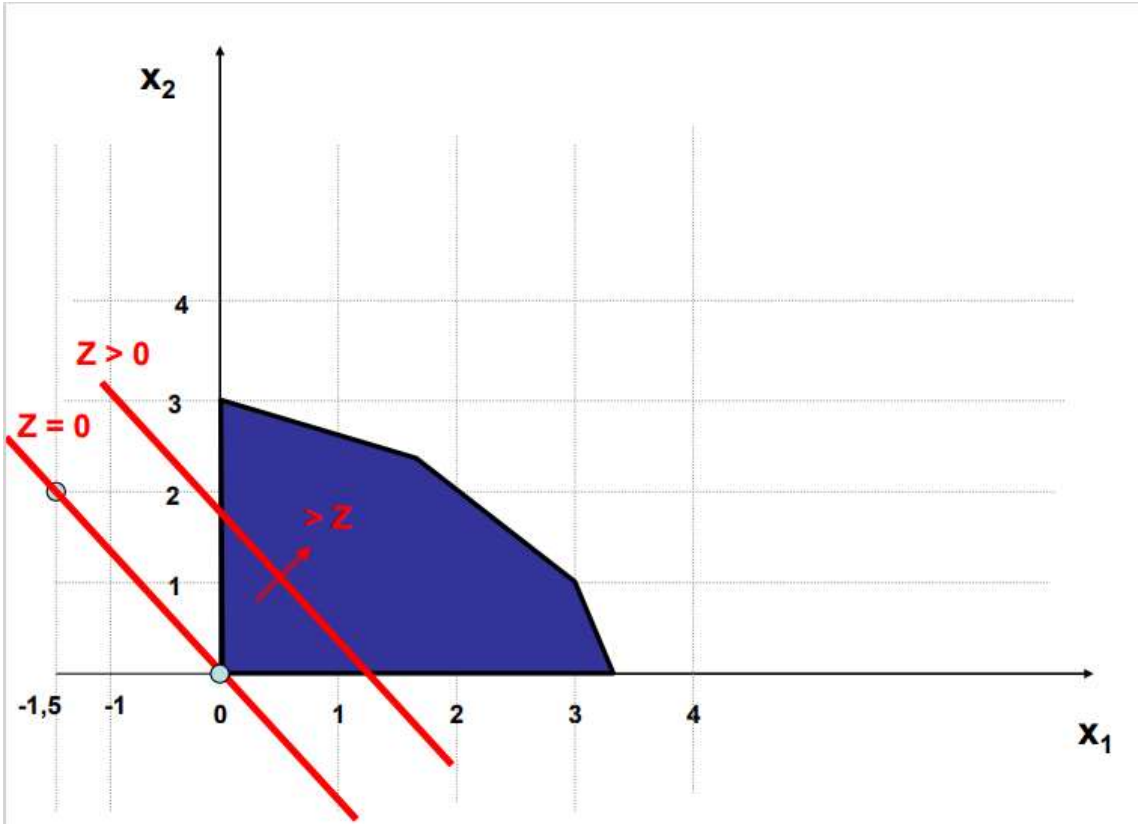

x_2
$0 = 4\,x_1 + 3\,x_2$
$x_1 = -\,3/4\,x_2$
3
2
1
1
2
3
4
x_1

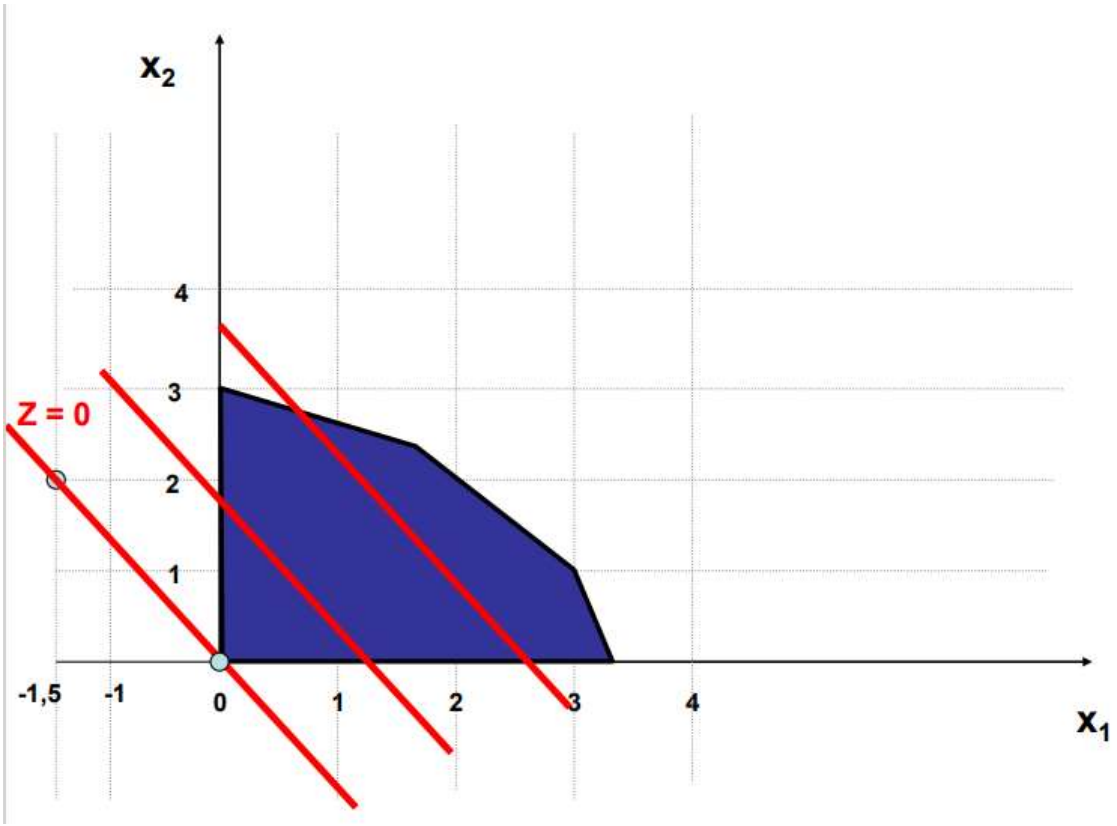

x_2
$0 = 4\,x_1 + 3\,x_2$
$x_1 = -\,3/4\,x_2$
Para $x_2 = 0 \rightarrow x_1 = 0$
3
2
1
1
2
3
4
x_1

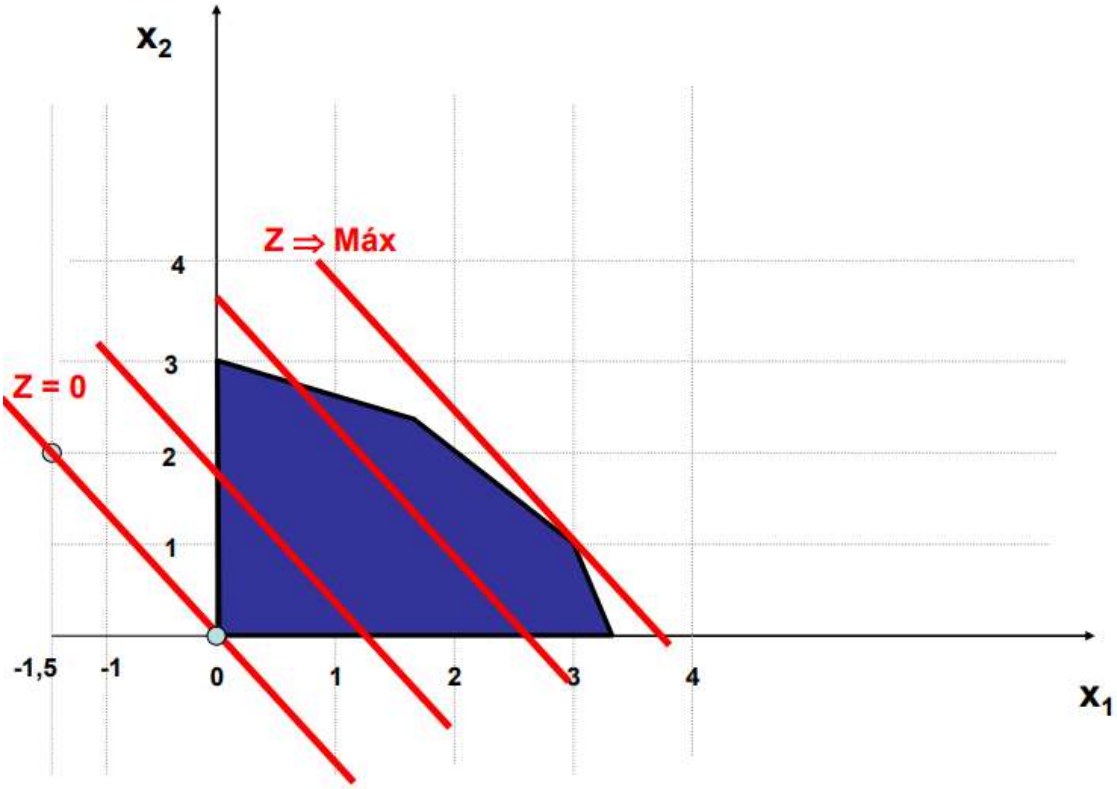

x_2
$0 = 4\ x_1 + 3\ x_2$
$x_1 = -\ 3/4\ x_2$
Para $x_2 = 2 \rightarrow x_1 = -\ 1,50$
3
2
1
-1,5
-1
1
2
3
4
x_1

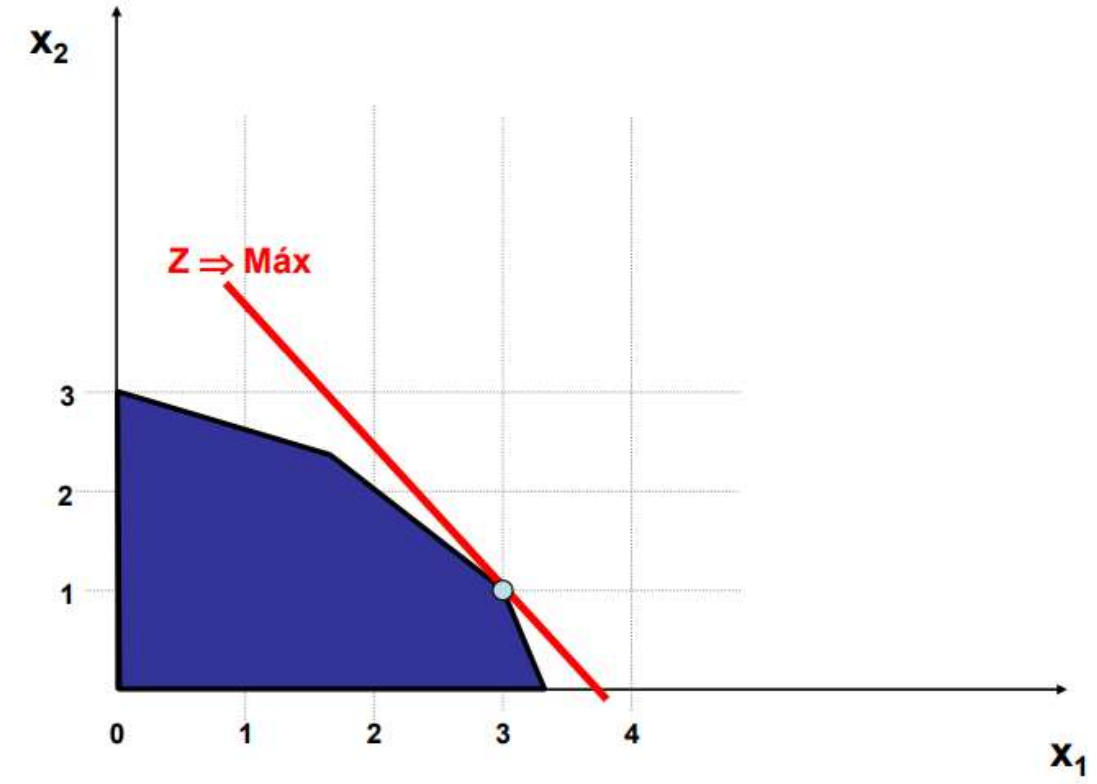

x_2
$0 = 4\ x_1 + 3\ x_2$
Z = 0
4
3
2
1
-1,5
-1
0
1
2
3
4
x_1

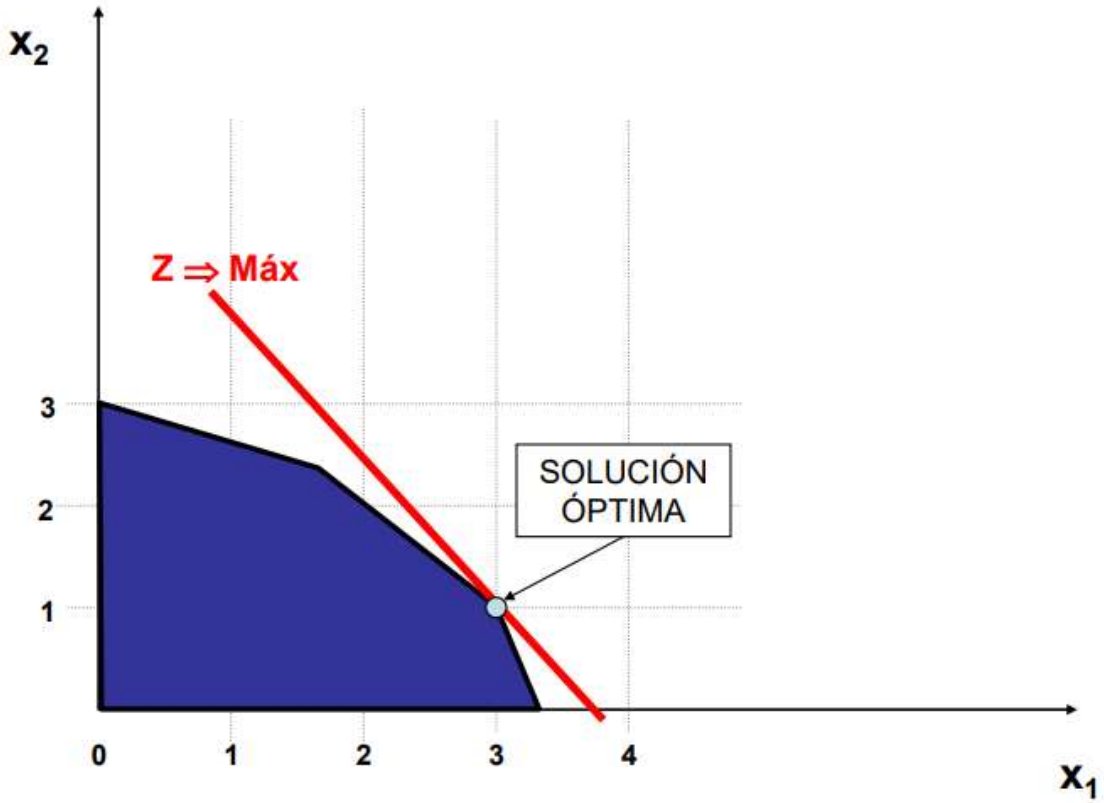

x2
4
Z > 0
3
Z = 0
2
1
-1,5
-1
0
1
2
3
4
x1

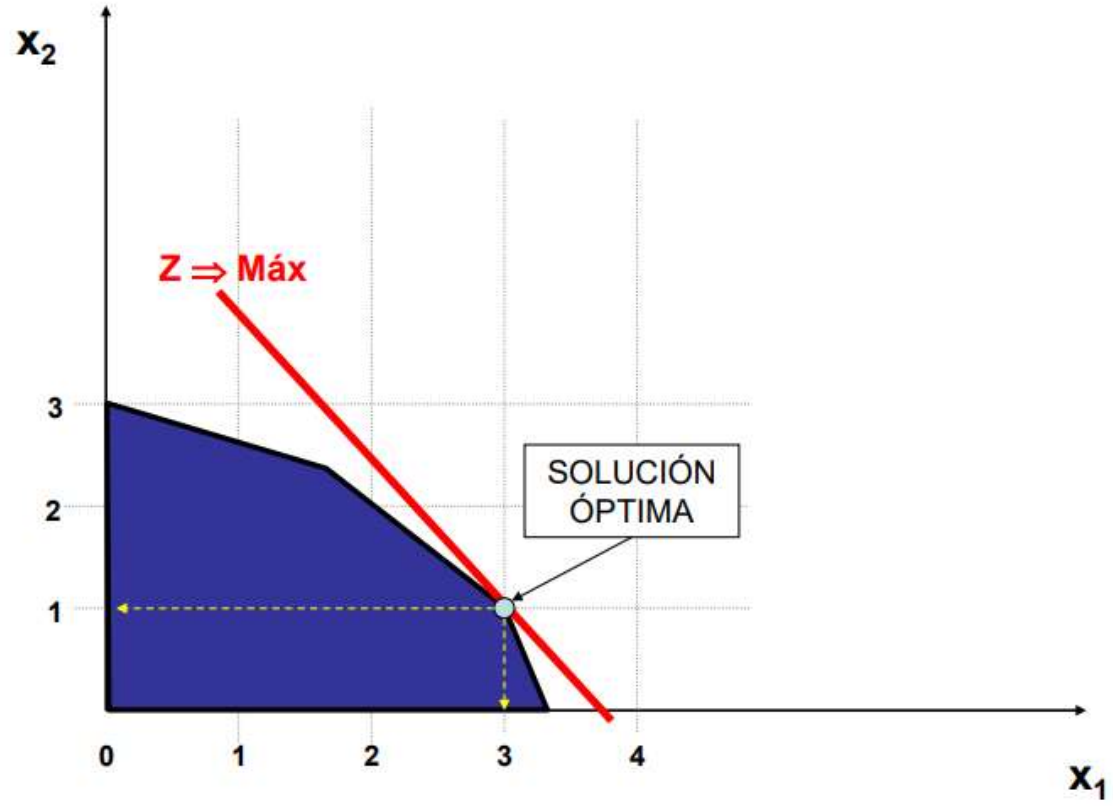

x2
4
Z > 0
3
Z = 0
2
> Z
1
-1,5
-1
0
1
2
3
4
x1

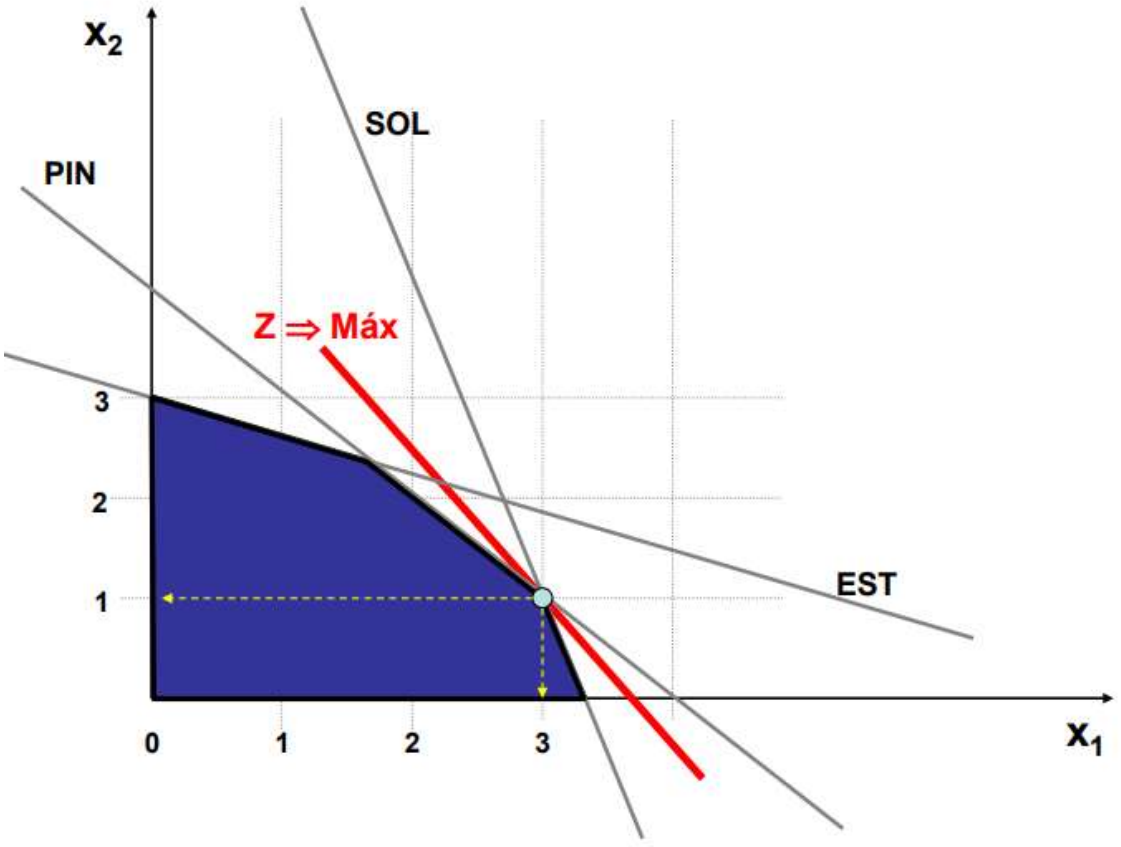

x2
4
3
Z = 0
2
1
-1,5
-1
0
1
2
3
4
x1


x2
Z ⇒ Máx
4
3
Z = 0
2
1
-1,5
-1
0
1
2
3
4
x1


x_2
Z ⇒ Máx
3
2
1
0
1
2
3
4
x_1


x_2
Z ⇒ Máx
SOLUCIÓN ÓPTIMA
3
2
1
0
1
2
3
4
x_1


x_2
Z ⇒ Máx
3
2
1
SOLUCIÓN
ÓPTIMA
0
1
2
3
4
x_1


x_2
SOL
PIN
Z ⇒ Máx
3
2
1
EST
0
1
2
3
x_1