① Máx $3u_1 + 2u_2$

Suj $-2u_1 + u_2 \le 1$

$u_1 \le 2$

$u_1 + u_2 \le 3$

$u_1, u_2 \ge 0$

Máx $3u_1 + 2u_2$

$-2u_1 + u_2 + u_3 = 1$

$u_1 + u_4 = 2$

$u_1 + u_2 + u_5 = 3$

1a

	u_1	u_2	u_3	u_4	u_5	
u_3	-2	1	1	0	0	1
u_4	①	0	0	1	0	2
u_5	1	1	0	0	1	3
	-3	-2	0	0	0	0

	u_1	u_2	u_3	u_4	u_5	
u_3	0	1	1	2	0	5
u_1	1	0	0	1	0	2
u_5	0	①	0	-1	1	1
	0	-2	0	3	0	6

	u_1	u_2	u_3	u_4	u_5	
u_3	0	0	1	3	-1	4
u_1	1	0	0	1	0	2
u_2	0	1	0	-1	1	1
	0	0	0	1	2	8

1b

	u_1	u_2	u_3	u_4	u_5	
u_3	-2	1	1	0	0	1
u_4	①	0	0	1	0	2
u_5	1	1	0	0	1	3
	-1	-1	0	0	0	0

	u_1	u_2	u_3	u_4	u_5	
u_3	0	1	1	2	0	5
u_1	1	0	0	1	0	2
u_5	0	①	0	-1	1	1
	0	-1	0	1	0	2

	u_1	u_2	u_3	u_4	u_5	
u_3	0	0	1	3	-1	4
u_1	1	0	0	1	0	2
u_2	0	1	0	-1	1	1
	0	0	0	0	1	3

② a) Máx $3u_1 + 2u_2$

$$u_1 - u_2 \leq 1$$
$$u_1 + u_2 \leq 3$$
$$u_1 \qquad \leq 2$$
$$u_1, u_2 \geq 0$$

Máx $3u_1 + 2u_2$

$$u_1 - u_2 + u_3 = 1$$
$$u_1 + u_2 + u_4 = 3$$
$$u_1 + u_5 = 2$$

	u_1	u_2	u_3	u_4	u_5	
u_3	①	-1	1	0	0	1
u_4	1	1	0	1	0	3
u_5	1	0	0	0	1	2
	-3	-2	0	0	0	0

	u_1	u_2	u_3	u_4	u_5	
u_1	1	-1	1	0	0	1
u_4	0	②	-1	1	0	2
u_5	0	1	-1	0	1	1
	0	-5	3	0	0	3

$$\frac{2+\varepsilon}{2} = 1 + \varepsilon/2 \text{ (menor)}$$

$$\frac{1+\varepsilon}{1} = 1 + \varepsilon \text{ (maior)}$$

	u_1	u_2	u_3	u_4	u_5	
u_1	1	0	½	½	0	2
u_2	0	1	-½	½	0	1
u_5	0	0	-½	-½	1	0
	0	0	½	5/2	0	8

Esta solução é degenerada

2b) Máx $3u_1 + 2u_2$

$$u_1 - u_2 \leq 1$$
$$u_1 + u_2 \leq 3$$
$$u_1 \geq 1$$
$$u_1, u_2 \geq 0$$

Máx $3u_1 + 2u_2$

$$u_1 - u_2 + u_3 = 1$$
$$u_1 + u_2 + u_4 = 3$$
$$u_1 - u_5 + a_1 = 1$$

I fase

	u_1	u_2	u_3	u_4	u_5	a_1	
u_3	1	-1	1	0	0	0	1
u_4	1	1	0	1	0	0	3
a_1	(1)	0	0	0	-1	1	1
f.o.	-3	-2	0	0	0	0	0
Min a_1	0	0	0	0	0	1	0
	-1	0	0	0	1	-1	-1
	-1	0	0	0	1	0	-1

	u_1	u_2	u_3	u_4	u_5	a_1	
u_3	0	-1	1	0	(1)	-1	0
u_4	0	1	0	1	1	-1	2
u_1	1	0	0	0	-1	1	1
f.o.	0	-2	0	0	-3	3	3
Min a_1	0	0	0	0	0	1	0

II FASE

	u_1	u_2	u_3	u_4	u_5	
u_5	0	-1	1	0	1	0
u_4	0	(2)	-1	1	0	2
u_1	1	-1	1	0	0	1
	0	-5	3	0	0	3

	u_1	u_2	u_3	u_4	u_5	
u_5	0	0	$1/2$	$1/2$	1	1
u_2	0	1	$-1/2$	$1/2$	0	1
u_1	1	0	$+1/2$	$1/2$	0	2
	0	0	$1/2$	$5/2$	0	8

2c) Máx $3u_1 + 2u_2$
$$u_1 - u_2 \leq 1$$
$$u_1 + u_2 \leq 3$$
$$u_1 \geq 3$$
$$u_1, u_2 \geq 0$$

Máx $3u_1 + 2u_2$
$$u_1 - u_2 + u_3 = 1$$
$$u_1 + u_2 + u_4 = 3$$
$$u_1 - u_5 + a_1 = 3$$

I FASE

	u_1	u_2	u_3	u_4	u_5	a_1	
u_3	①	-1	1	0	0	0	1
u_4	1	1	0	1	0	0	3
a_1	1	0	0	0	-1	1	3
Mín a_1	0	0	0	0	0	1	0
	-1	0	0	0	1	-1	-3
	-1	0	0	0	1	0	-3

Como a_1 não sai de base, não conseguimos arranjar uma solução básica inicial e o problema é impossível (isto depois de fazer vários quadros).

Interpretação gráfica

$u_1 \geq 3$

$u_1 - u_2 \leq 1$

$u_1 + u_2 \leq 3$