

Problem Set-Up (Black pen is ~~not~~ given in problem)

①

① Basis ~~here~~ is x_3, x_1, x_5

② BFS is 110

③ LP Unbounded

④ Appropriate simplex tableau

Notice this is negative, showing this isn't yet an "optimal" tableau w/ non-neg in coefficient row.

Notice about the

BV	Z	x_1	x_2	x_3	x_4	x_5	RHS
Z	1		2	(-3)			
x_3	0						6
x_1	0						10
x_5	0						4

Since x_1 & x_5 are basic variables, we set the rows to be:

BV	Z	x_1	x_2	x_3	x_4	x_5	RHS
Z	1	0	2	-3		0	
x_3	0	0				0	6
x_1	0	1				0	10
x_5	0	0				1	4

Now, how do we deal w/ x_3 ?

↳ Want it to be in that "identity format"
 ↳ So, the "pivot" should lie at x_3 according to minimum ratio, so let's put in

BV	Z	x_1	x_2	x_3	x_4	x_5	RHS	Ratio
Z	1	0	2	-3		0		—
x_3	0	0		6		0	6	$6/6=1$
x_1	0	1		-6		0	10	∞ , since neg in denom
x_5	0	0		-6		1	4	∞ , "

Yay, fan-fucking-tastic, let's ~~part~~ make this an optimal tableau & we could decide on what to fill in the things we don't know ②

So,

BV	Z	x_1	x_2	x_3	x_4	x_5	RHS
Z	1	0		-3		0	K
x_3	0	0		6		0	6
x_1	0	1		-6		0	10
x_5	0	0		-6		1	4

→ I DK what this is yet, but we'll find out.

from before.

Also, while I'm here...

Why 6 & -6?

↳ I'm a lazy piece of shit and I like nice numbers, sue me.

Anyway, back to the task of ~~row~~ row-reducing...

BV	Z	x_1	x_2	x_3	x_4	x_5	RHS
Z	1	0		0		0	$K+3 = 10 \rightarrow$ so $K = 107$
x_3	0	0		1		0	1
x_1	0	1		0		0	16
x_5	0	0		0		1	10

Yay!!! ~~We're~~ We're done... JK, we've got more shit to do...

~~But what~~
 Alright, we've ignored x_2 since I wasn't sure what to do with the 2. I now know we oughta make it non-neg @ optimality, so I'm just gonna pick some values that make it happen in the original tableau:

BV	Z	x_1	x_2	x_3	x_4	x_5	RHS
Z	1	0	2	-3		0	107
x_3	0	0	12	6		0	6
x_1	0	1	2	-6		0	10
x_5	0	0	2	-6		1	4

Optimal

BV	Z	x_1	x_2	x_3	x_4	x_5	RHS
Z	1	0					
x_3	0	0					
x_1	0	1					
x_5	0	0					

"Optimal" again for verification of prev. step

BV	Z	X ₁	X ₂	X ₃	X ₄	X ₅	RHS
Z	1	0	8	0		0	110
X ₃	0	0	2	1		0	6
X ₁	0	1	14	0		0	16
X ₅	0	0	14	0		1	10

↳ Yay! We did it! We've made sure this column not matter!

It's probably a good time to note we've fulfilled that

- i) BFS is 110
- ii) ~~BV~~ Basic variables are X₃, X₁, X₅.

We only need now to fulfill infeasibility

↳ Occurs when there is a column of non-basic variable that contains non-positive entries. So I'm just going to say @ "optimality", it looks like this for column X₄, since we get to pick all values.

BV	Z	X ₁	X ₂	X ₃	X ₄	X ₅	RHS
Z	1	0	8	0	0	0	110
X ₃	0	0	2	1	-1	0	6
X ₁	0	1	14	0	-1	0	16
X ₅	0	0	14	0	-1	1	10

why this?

↳ Once again, I'm a lazy piece of shit

which means, the original tableau ought to be

(4)

BV	Z	X ₁	X ₂	X ₃	X ₄	X ₅	RHS
Z	1	0	2	-3	3	0	107
X₂	0	0	12	6	-6	0	6
X ₁	0	1	2	-6	5	0	10
X ₅	0	0	2	-6	5	1	4

Or anything, just not X₃, X₄, or X₅
 There are more solutions, but I can't be used to find the general constraints for each blank/colum.

And now, for verification, let's do the next steps of the simplex on this tableau:

- 1) Pick the most negative coefficient in first row as our entering variable & pick the least amount according to ratio test as our leaving

BV	Z	X ₁	X ₂	X ₃	X ₄	X ₅	RHS
Z	1	0	2	(-3)	3	0	107
X₂	0	0	12	6	-6	0	6
X ₁	0	1	2	-6	5	0	10
X ₅	0	0	2	-6	5	1	4

2) Pick the pivot

⇓ Optimal. I'm going to skip steps to save paper & time.

BV	Z	X ₁	X ₂	X ₃	X ₄	X ₅	RHS
Z	1	0	8	0	0	0	110
X ₃	1	0	2	1	-1	0	1
X ₁	0	1	14	0	-1	0	16
X ₅	0	0	14	0	-1	1	10

1) X₃ our basis

Infeasible 3)