MATB61 TUT3/4 Final Review
Playing with the Simplex Tableaux

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This document is for the students in MATB61, TUT0003 and TUT0004 winter 2021 at the University of Toronto Scarborough. You should not use this document as your reference in the final exam. Everything covered in this document have been talked about in the lectures or in the textbook. The purpose of this document is for students to do more practices at various types of questions that they have seen in class. Also some questions are designed for students to detect the mistakes that the questions have by the definitions of the concepts. This document may not covered all materials that will appear in the final exam.

You have seen this question in the worksheet. We will look at this question again more generally. Consider the following tableaux which occurs at a current BFS when running the simplex algorithm.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	
0	J	0	A	1	0	3	B
H	0	1	-2	C	D	-1	2
1	0	0	0	-1	1	1	3
0	0	0	E	-3	F	G	I

Find the choices of $A, B, C, D, E, F, G, H, I$ and J for each of the following statement, such that the statement is true without ambiguity following the notations that we have. Only give explicit values when it is necessary (with explanation) , otherwise find a largest possible range for the unknown. If it is not possible to find one choice, explain why.

1. The current basic variables are x_1, x_2, x_3, and the other variables are non-basic variables.

2. The current BFS is an optimal solution with current cost 32, and the basic variables x_2, x_3, x_6.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	
0	J	0	A	1	0	3	B
H	0	1	-2	C	D	-1	2
1	0	0	0	-1	1	1	3
0	0	0	E	-3	F	G	I

3. The LPP has no optimal solution and the cost is infinite followed from the above tableaux.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	
0	J	0	A	1	0	3	B
H	0	1	-2	C	D	-1	2
1	0	0	0	-1	1	1	3
0	0	0	E	-3	F	G	I

4. The current BFS is not an optimal solution, and we will get a solution with higher cost by introducing the variable x_4 as basic variable.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	
0	J	0	A	1	0	3	B
H	0	1	-2	C	D	-1	2
1	0	0	0	-1	1	1	3
0	0	0	E	-3	F	G	I

5. The current BFS is an optimal solution, but the optimal solution is not unique. Explicitly give two distinct optimal solutions.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	
0	J	0	A	1	0	3	B
H	0	1	-2	C	D	-1	2
1	0	0	0	-1	1	1	3
0	0	0	E	-3	F	G	I

6. The current BFS is not an optimal solution and we are not sure whether the given LPP has an optimal solution or not yet, but we would be able to conclude that the LPP has no optimal solution after one iteration of the simplex method.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	
0	J	0	A	1	0	3	B
H	0	1	-2	C	D	-1	2
1	0	0	0	-1	1	1	3
0	0	0	E	-3	F	G	I

7. The current BFS is not an optimal solution. We could introduce x_6 to be the basic variable, and x_3 will become non-basic, to get a BFS with a higher cost.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	
0	J	0	A	1	0	3	B
H	0	1	-2	C	D	-1	2
1	0	0	0	-1	1	1	3
0	0	0	E	-3	F	G	I

8. This tableaux occurs at a BFS when x_2 is a basic varible and $B < 0$.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	
0	J	0	A	1	0	3	B
H	0	1	-2	C	D	-1	2
1	0	0	0	-1	1	1	3
0	0	0	E	-3	F	G	I