University of Toronto at Scarborough
Department of Computer and Mathematical Sciences

Linear Programming and Optimazation

MATB61 Winter 2020

Selected answers to the assignment   # 4

Section 2.1

#2

	X1	X2	X3	X4	X5	Z	
X4	2	-5	1	1	0	0	3
X5	1	4	0	0	1	0	5
	- 1	- 3	-5	0	0	1	0

#4

	x_1	x_2	x_3	x_4	
x_1	1	0	10/9	2/3	4
x_2	0	1	34/27	−4/9	16/3
	0	0	22/9	8/3	28

#6

Using x_2 as the departing variable:

	x_1	x_2	x_3	x_4	x_5	
x_3	−7/30	−3/5	1	0	0	0
x_4	3/2	1	0	1	0	5/2
x_5	14/3	−2/9	0	0	1	1/9
	23/2	5	0	0	0	89/6

Using x_3 as the departing variable:

	x_1	x_2	x_3	x_4	x_5	
x_4	10/9	0	5/3	1	0	5/2
x_2	7/18	1	−5/3	0	0	0
x_5	385/81	0	−10/27	0	1	1/9
	86/9	0	25/3	0	0	89/6

#8 $[4 \ 0 \ 0 \ 0 \ 4 \ 10 \ 0]^T$

#16 Make 25,000 bags of GARDEN only. Net profit = $10,000.

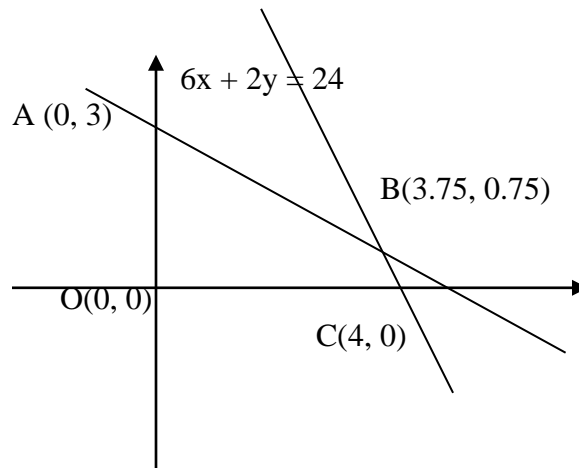#20 The optimal solution: $z = 28/3$; $x_1 = 0$, $x_2 = 4$, $x_3 = 4/3$, $x_4 = 0$.

#22 No finite optimal solution.

#23 The optimal solution: $z = 36$; $x = 0$, $y = 12$, $z = 0$, $w = 0$

#24 We have no means of finding an initial basic feasible solution.

In Addition:

1. Graph:

6x + 2y = 24
A (0, 3)
B(3.75, 0.75)
O(0, 0)
C(4, 0)

Optimal solution is 33/4 at B.

Simplex:
Tableau #1

x	y	s1	s2	p	
3	5	1	0	0	15
6	2	0	1	0	24
-2	-1	0	0	1	0	Corner [0, 0]

Tableau #2

x	y	s1	s2	p	
0	4	1	-0.5	0	3
1	0.333333	0	0.166667	0	4
0	-0.333333	0	0.333333	1	8	Corner [4, 0]

Tableau #3

x	y	s1	s2	p	
0	1	0.25	-0.125	0	0.75
1	0	-0.0833333	0.208333	0	3.75
0	0	0.0833333	0.291667	1	8.25	Corner [3.75, 0.75]

2

2. Suppose that we have x_{ij} pounds of each product as follows:

	Fresh	Smoked on regular time	Smoked on overtime
Hams	x_{11}	x_{12}	x_{13}
Bellies	x_{21}	x_{22}	x_{23}
Picnics	x_{31}	x_{32}	x_{33}

Then the LP problem should be

Maximizes $z = 8x_{11} + 14x_{12} + 11x_{13} + 4x_{21} + 12x_{22} + 7x_{23} + 4x_{31} + 13x_{32} + 9x_{33}$

Subject to

$$x_{11} + x_{12} + x_{13} \leq 480$$
$$x_{21} + x_{22} + x_{23} \leq 400$$
$$x_{31} + x_{32} + x_{33} \leq 230$$
$$x_{12} + x_{22} + x_{23} \leq 420$$
$$x_{13} + x_{23} + x_{33} \leq 250$$
$$x_{ij} \geq 0, \ i, j = 1, 2, 3.$$

Optimal Solution: $p = 10910$; $x_{11} = 440$, $x_{12} = 0$, $x_{13} = 40$,
$x_{21} = 0$, $x_{22} = 400$, $x_{23} = 0$,
$x_{31} = 0$, $x_{32} = 20$, $x_{32} = 210$.