

OR_prelecture_0425

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No. _____
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(C) $\min 3x_1 + 5x_2$

s.t. $x_1 + x_2 + x_3 = 16$

$x_1 + 2x_2 + x_4 = 20$

$x_i \geq 0, \forall i = 1, \dots, 4$

-3	-5	0	0	0
<u>1</u>	1	1	0	$x_3 = 16$
1	2	0	1	$x_4 = 20$

↓

0	-2	3	0	48
1	1	1	0	$x_3 = 16$
0	<u>1</u>	-1	1	$x_4 = 4$

↓

0	0	1	2	56
1	0	2	-1	$x_3 = 12$
0	1	-1	1	$x_4 = 4$

Optimal solution = $(x_1, x_2) = (12, 4)$

value = 56

new constraint: $x_1 + x_2 \leq 14$

$(x_1 + x_2 + x_5) = 14$

b) Let $B = (x_1, x_2, x_5)$ and $N = (x_3, x_4)$

$$C_B = \begin{bmatrix} 3 \\ 5 \\ 0 \end{bmatrix}, C_N = \begin{bmatrix} 0 \\ 0 \end{bmatrix}, A_B = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 2 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

$$A_N = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix}, b = \begin{bmatrix} 16 \\ 20 \\ 14 \end{bmatrix}$$

We then have $A_B^{-1} = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$

$$A_B^{-1} A_N = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ -1 & 1 \\ -1 & 0 \end{bmatrix}$$

$$A_B^{-1} b = \begin{bmatrix} 12 \\ 4 \\ -2 \end{bmatrix}, C_B^T A_B^{-1} A_N - C_N^T = [1 \ 2], C_B^T A_B^{-1} b = 56$$

This give us a new Tableau

0	0	1	2	0	56
1	0	2	-1	0	$x_1 = 12$
0	1	-1	1	0	$x_2 = 4$
0	0	-1	0	1	$x_5 = -2$
↓					
0	0	0	2	1	54
1	0	0	-1	2	$x_1 = 8$
0	1	0	1	-1	$x_2 = 6$
0	0	1	0	-1	$x_3 = 2$

New optimal solution: $(8, 6, 2)$

value = 54