

Ch 5  
#17

Re-write problem as the following maximum problem.

Maximize  $-3x_1 + -4x_2 + 8x_3$

s.t.  $x_1, x_2, x_3 \geq 0$  and

$$\begin{cases} 4x_1 + 2x_2 \geq 12 \\ 4x_2 + 8x_3 \geq 16 \end{cases}$$

In standard form

Max  $-3x_1 - 4x_2 - 8x_3 + 0s_1 + 0s_2$

s.t.  $x_1, x_2, x_3, s_1, s_2 \geq 0$  and

$$\begin{cases} 4x_1 + 2x_2 - 1s_1 = 12 \\ 4x_2 + 8x_3 - s_2 = 16 \end{cases}$$

Introducing artificial variables

Max  $-3x_1 - 4x_2 - 8x_3 + 0s_1 - M a_1 + 0s_2 - M a_2$

s.t.  $x_1, x_2, x_3, s_1, a_1, s_2, a_2 \geq 0$  and

$$\begin{cases} 4x_1 + 2x_2 - 1s_1 + 1a_1 = 12 \\ 4x_2 + 8x_3 - s_2 + 1a_2 = 16 \end{cases}$$

Set up initial tableau

Basis	CB	$x_1$	$x_2$	$x_3$	$s_1$	$a_1$	$s_2$	$a_2$	RHS
$a_1$	-M	4	2	0	-1	1	0	0	12
$a_2$	-M	0	4	8	0	0	-1	1	16
$z_j$		-4M	-6M	-8M	M	-M	M	-M	-28M
$C_j - z_j$		-3+4M	-4+6M	-8+8M	-M	0	-M	0	

After 1<sup>st</sup> iteration

Basis	CB	$x_1$	$x_2$	$x_3$	$s_1$	$a_1$	$s_2$	RHS
$a_1$	-M	4	2	0	-1	1	0	12
$x_3$	-8	0	1/2	1	0	0	-1/8	2
$z_j$		-4M-4-2M	-8	M	-M	1		-16-12M
$C_j - z_j$		-3+4M	2M	0	-M	0	-1	

After 2<sup>nd</sup> iteration

Basis	CB	$x_1$	$x_2$	$x_3$	$s_1$	$s_2$	RHS
$x_1$	-3	1	1/2	0	-1/4	0	3
$x_3$	-8	0	1/2	1	0	-1/8	2
$z_j$		-3	-11/2	-8	3/4	1	-25
$C_j - z_j$		0	3/2	0	-3/4	-1	

After 3<sup>rd</sup> iteration

Basis	CB	$x_1$	$x_2$	$x_3$	$s_1$	$s_2$	RHS
$x_1$	-3	1	0	-1	-1/4	0	1
$x_2$	-4	0	1	2	0	-1/4	4
$z_j$		-3	-4	5	3/4	1/8	-19
$C_j - z_j$		0	0	-13	-3/4	-5/8	

So, our complete optimal solution is

$x_1 = 4, x_2 = 4, x_3 = 0, s_1 = 0, s_2 = 0$   
and the optimal value of the objective function is 19.