

Quiz #4 Answer Key

Please show your work and feel free to use the back of the sheet if you need more room.

1 We are given the following LLP:

$$\begin{aligned}
 &\text{Maximize } z = 3x_1 + 2x_2 \\
 &\text{subject to} \\
 &x_1 + x_2 \leq 7, \\
 &x_1 + 2x_2 \geq 1, \\
 &x_1 + 4x_2 \leq 8, \\
 &x_1 \geq 0, x_2 \geq 0
 \end{aligned}$$

Adding slack variables to change to canonical form, we have

$$\begin{aligned}
 &\text{Maximize } z = 3x_1 + 2x_2 \\
 &\text{subject to} \\
 &x_1 + x_2 + x_3 = 7, \\
 &x_1 + 2x_2 - x_4 = 1, \\
 &x_1 + 4x_2 + x_5 = 8, \\
 &x_1 \geq 0, x_2 \geq 0, x_3 \geq 0, x_4 \geq 0, x_5 \geq 0.
 \end{aligned}$$

Finally, adding artificial variables, we have

$$\begin{aligned}
 &\text{Maximize } z = 3x_1 + 2x_2 \\
 &\text{subject to} \\
 &x_1 + x_2 + x_3 = 7, \\
 &x_1 + 2x_2 - x_4 + x_6 = 1, \\
 &x_1 + 4x_2 + x_5 = 8, \\
 &x_1 \geq 0, x_2 \geq 0, x_3 \geq 0, x_4 \geq 0, x_5 \geq 0, x_6 \geq 0.
 \end{aligned}$$

We wish to use the 2-phase method to find a basic feasible solution and then to find the optimal point. To start the first phase, we have the tableau below. What is the function to minimize for the first phase? Given that, fill in the bottom line of the tableau in the correct form to start the simplex method.

I have filled in the bottom line:

	x_1	x_2	x_3	x_4	x_5	x_6	
x_3	1	1	1	0	0	0	7
x_6	1	2	0	-1	0	1	1
x_5	1	4	0	0	1	0	8
	-1	-2	0	1	0	0	-1

2 The next phase, and last step of the first phase is

	x_1	x_2	x_3	x_4	x_5	x_6	
x_3	$1/2$	0	1	$1/2$	0	$-1/2$	$13/2$
x_2	$1/2$	1	0	$-1/2$	0	$1/2$	$1/2$
x_5	-1	0	0	2	1	-2	6
	0	0	0	0	0	1	0

Write below the first tableau for the second phase of the problem. Please make sure the bottom line is in the correct form to start the simplex method.

The next tableau is

	x_1	x_2	x_3	x_4	x_5	
x_3	$1/2$	0	1	$1/2$	0	$13/2$
x_2	$1/2$	1	0	$-1/2$	0	$1/2$
x_5	-1	0	0	2	1	6
	-2	0	0	-1	0	1