Session 19 – Example of Simplex Based Sensitivity Analysis

Maximize $P = 2x_1 + 3x_2$
s.t. $x_1, x_2 \geq 0$ and

$1x_1 + 2x_2 \leq 6$
$2x_1 + 1x_2 \leq 8$

Initial Simplex Tableau:

		x_1	x_2	s_1	s_2	
Basis	c_B	2	3	0	0	RHS
s_1	0	1	2	1	0	6
s_2	0	2	1	0	1	8
z_j		0	0	0	0	0
$c_j - z_j$		2	3	0	0	

The Final Tableau:

		x_1	x_2	s_1	s_2	
Basis	c_B	2	3	0	0	RHS
x_2	3	0	1	2/3	-1/3	4/3
x_1	2	1	0	-1/3	2/3	10/3
z_j		2	3	4/3	1/3	32/3
$c_j - z_j$		0	0	-4/3	-1/3	

Optimal Solution: $x_1 = 10/3$, $x_2 = 4/3$, $P = 32/3$

We calculate the range of optimality for the objective function coefficient of x_1 by replacing the numerical value of the coefficient of x_1 with c_1 everywhere it occurs in the final simplex tableau.

		x_1	x_2	s_1	s_2	
Basis	c_B	c_1	3	0	0	RHS
x_2	3	0	1	2/3	-1/3	4/3
x_1	c_1	1	0	-1/3	2/3	10/3
z_j		c_1	3	$2 - c_1/3$	$-1 + 2c_1/3$	$4 + 10c_1/3$
$c_j - z_j$		0	0	$c_1/3 - 2$	$-2c_1/3 + 1$	

$x_1 = 10/3$, $x_2 = 4/3$ will remain the optimal solution provided

$c_1/3 - 2 \leq 0$ and $-2c_1/3 + 1 \leq 0$.

Finish the computation of the range of optimality for the objective function coefficient of x_1 in the space below.