§6.2 (Part 2): Some Important Formulas

1.] Recall the two variable LP (Problem Set 3, Number 1). Below the LP is in standard form along with its partially filled out optimal tableau.

Maximize: $z = 2x_1 + 2.5x_2$

Subject to:
$$\begin{aligned} x_1 + 2x_2 + s_1 \quad\quad &= 350 \\ 2x_1 + x_2 \quad\quad + s_2 &= 400 \\ x_1, x_2, s_1, s_2 &\geq 0 \end{aligned}$$

Row	Basic	z	x_1	x_2	s_1	s_2	RHS
0	z	1	0	0			
1	x_1	0	1	0			
2	x_2	0	0	1			

a.) Using the set of basic variables that yield the optimal solution, identify the vectors $\boldsymbol{x}_{BV}$, $\boldsymbol{x}_{NBV}$, $\boldsymbol{c}_{BV}$, $\boldsymbol{c}_{NBV}$ and the matrices B and N.

b.) Compute the matrix $B^{-1}N$ and use it to fill in the columns of the non-basic variables in the optimal tableau.

c.) Use the formula $\overline{c_j} = \boldsymbol{c}_{BV}^T B^{-1}\boldsymbol{a}_j - c_j$ to compute the Row 0 coefficients of the non-basic variables.

d.) Compute $B^{-1}\boldsymbol{b}$ to find the RHS of each constraint for the optimal set of basic variables.

e.) Use the formula $\boldsymbol{c}_{BV}^T B^{-1}\boldsymbol{b}$ to find the optimal RHS in Row 0.

f.) Suppose we changed the coefficient for x_2 in the objective function to $2.5+\Delta c_2$. Find the optimality range by computing the coefficients in Row 0 of the non-basic variables.