Summary of Computations for Sensitivity Analysis

Let $\hat{\mathbf{c}}$ be the Row 0 from the final tableau (it's not negative, like $-\mathbf{c}$)

I. Change Row 0

- Change a value from NBV (coordinate k):

$$\hat{c}_k - \Delta > 0$$

- Change to a BV (which is the k^{th} one in the list of BVs):
  "From the final tableau, take Row 0 $+\Delta$ times the k^{th} row".
  NOTE: This is only for the columns corresponding to the NBVs. Set the BV columns to zero.

II. Change the RHS ("changes in $\mathbf{b}$"). If we change the k^{th} constraint,
"From the final tableau, take the RHS and add Δ times the k^{th} column of B^{-1}."

III. Change a column of a non-basic variable

- Same idea applies to adding a new (non-basic) variable (this would add a new column $\mathbf{n}$ to the matrix A in the LP, with c_n in the objective function).
- NOTE: A change in the column to a basic variable is difficult, because the effects are very wide-spread.

For any column corresponding to a new variable or to a changed NBV, $\mathbf{n}$, with coefficient c_n in the objective function, the new column in the final tableau is given by:

$$B^{-1}\mathbf{n}$$

The change to the new Row 0 value is: $-c_n + \mathbf{c}_B^T B^{-1}\mathbf{n}$ (this was called *pricing out the new variable.*

IV. Add a new constraint (See 6.11).

The Formulae

$$\begin{array}{c|c} -\mathbf{c}^T & 0 \\ \hline A & \mathbf{b} \end{array} \longrightarrow \begin{array}{c|c} -\mathbf{c}^T + \mathbf{c}_B^T B^{-1} A & \mathbf{c}_B^T B^{-1}\mathbf{b} \\ \hline B^{-1}A & B^{-1}\mathbf{b} \end{array}$$

1. A change in a basic variable. The new Row 0 is: $-(\mathbf{c} + \Delta\vec{e}_i)^T + (\mathbf{c}_B + \Delta\vec{e}_k)^T B^{-1} A$
2. A change in the RHS. The new RHS is: $B^{-1}(\mathbf{b} + \Delta\vec{e}_i) = (B^{-1}\mathbf{b}) + \Delta(B^{-1})_i$