Simplex Algorithm:

(Assuming the problem is in Standard form with maximization type objective function)

1. Start
2. Read the technological coefficients matrix $\boldsymbol{a} = [\boldsymbol{a_{ij}}], i = 1,2,\dots,m; j = 1,2,\dots,n$
3. Read the right hand side vector $\boldsymbol{b} = [\boldsymbol{b_i}]$ for $i = 1,2,\dots,m$
4. Read the cost vector $\boldsymbol{c} = [\boldsymbol{c_j}]$ for $j = 1,2,\dots,n$
5. Initialize solution $x_1 = 0, x_2 = 0, \dots, x_n = 0$
6. Identify the basic variables in the initial basic feasible solution $(\boldsymbol{x_B})$ and corresponding cost coefficients $(\boldsymbol{c_B})$; Initialize $\boldsymbol{x_B} = \boldsymbol{b}$
7. Construct indicator vector whose elements are $(z_j - c_j)$ values, where $\boldsymbol{z_j} = \boldsymbol{c_B a_j} - \boldsymbol{c_j}$, $\boldsymbol{a_j}$ is the j-th column of a
8. Construct the initial simplex tableau $\boldsymbol{tab}$;
   (Hint: you can write $a = [a\ b; indicator\ vector\ c_B x_B]$)
9. If all $(z_j - c_j) \geq 0$ i.e., $\boldsymbol{tab_{end,j} \geq 0}$ and no artificial variable is in basis at a positive value then the solution optimal; Terminate the program
   elseif, all $(z_j - c_j) \geq 0$ i.e., $\boldsymbol{tab_{end,j} \geq 0}$ and at least one artificial variable is in basis at a positive value then the problem is infeasible; Terminate the program
   elseif, any $(z_j - c_j) < 0$ i.e., $\boldsymbol{tab_{end,j} < 0}$ then go to **Step 10**
10. Find the most negative value and it's corresponding column index $\boldsymbol{j'}$in indicator vector;
    If all elements of tab_j are ≤ 0, then the problem is unbounded;
    Otherwise go to **Step 11**
11. For each row find $\frac{\boldsymbol{x_{Bi}}}{\boldsymbol{tab_{ij'}}}$, $(\boldsymbol{tab_{ij'} > 0})$ and find minimum of them, indicate that row as $\boldsymbol{i'}$**;**
    New basic variable is $\boldsymbol{j'}$-th variable and departing variable is $\boldsymbol{i'}$-th variable;
    Key element is $\boldsymbol{tab(i', j')}$
    Construct the new simplex tableau using the following steps:
    a) Create $\boldsymbol{tab\_temp = tab}$
    b) for new i'-th row: $\boldsymbol{tab_{i'j} = tab\_temp_{i'j} / tab_{i'j'}}$
    c) for new j'-th column: $\boldsymbol{tab_{ij'} = 0, for\ i \neq i'}$
    d) for other positions of the table**:**

$$\boldsymbol{tab_{ij} = tab\_temp_{ij} - \frac{(tab\_temp_{i'j})(tab\_temp_{ij'})}{tab_{i'j'}}, i \neq i', j \neq j'}$$

    Return to Step 9