Assignment 3: Solving LPP using Simplex Method

In this assignment, you will implement the simplex method in Python and use it to solve a given LPP.

Problem Statement

Consider a manufacturing company that produces three different products (A, B, and C) using two raw materials (X and Y). The company has a limited supply of the raw materials and wants to determine the optimal production quantities for each product to maximize its profit. The following table summarizes the data:

Product	Unit Profit (p)	X used (a)	Y used (b)
A	p1	a1	b1
B	p2	a2	b2
C	p3	a3	b3

The company has m units of raw material X and n units of raw material Y.

The linear programming problem is to determine the production quantities x1, x2, and x3 of products A, B, and C, respectively, that maximize the profit subject to the constraints:

$$a1 * x1 + a2 * x2 + a3 * x3 <= m$$

$$b1 * x1 + b2 * x2 + b3 * x3 <= n$$

$$x1 >= 0, x2 >= 0, x3 >= 0$$

Where `p1`, `p2`, `p3`, `a1`, `a2`, `a3`, `b1`, `b2`, and `b3` are given parameters. The objective function is to maximize the profit, which is given by:

$$p1 * x1 + p2 * x2 + p3 * x3$$

Task

1. Formulate the above problem as a linear programming problem.
2. Implement the simplex method in Python to solve the problem.
3. Print the optimal solution (i.e., the values of the decision variables that maximize the profit and the corresponding maximum profit)

Evaluation Criteria

- Correct formulation of the problem as an LPP. [20]
- Correct implementation of the simplex method. [50]
- Print the optimal solution and visualization (if applicable). [20]
- Clean explainable code [10]

Submission

- Please submit your implementation in a Jupyter Notebook (ipynb) file format.
- Name of the file should be ***registrationId_name.ipynb***

Good luck!