Worksheet #8 - The Simplex Method

In this worksheet, you will solve standard maximization problems using the simplex method.

Follow each step below to find the maximum value of the objective function \( P = 4x + 2y \) subject to the following constraints:

\[
\begin{aligned}
x + 2y &\leq 12 \\
3x + y &\leq 21 \\
x &\geq 0 \\
y &\geq 0
\end{aligned}
\]

(a) Add slack variables to change the first two inequalities into equalities.

(b) Write the equation for the objective function with all the variables on the left side. Make sure that the sign in front of \( P \) remains positive.

(b) Write down the initial simplex tableau; then find and label the pivot column, the test ratios, and the pivot.
(b) Use row-reduction operations to “zero out” the other entries in the pivot column, and then to turn the pivot into a 1.

(c) You should still have a negative number in the bottom row. Find the new pivot in the last tableau, then use row-reduction operations again to zero out the remaining entries.

There should be no remaining negative entries in the bottom row, so you are done applying the simplex method. Set the inactive variables to zero to answer the following two questions:

What is the maximum value of the objective function? ______________

Where is that maximum value attained? ______________
Use the simplex method to find the maximum value of the objective function $P = x + 2y$ subject to the constraints

$$\begin{aligned}
& x + y \leq 12 \\
& 3x + y \leq 21 \\
& x \geq 0 \\
& y \geq 0
\end{aligned}$$
Use the simplex method to find the maximum value of the objective function $P = x + 2y - z$
subject to the constraints

$$\begin{cases} x + y + z \leq 8 \\ 3x + y + 2z \leq 12 \\ x \geq 0 \\ y \geq 0 \\ z \geq 0 \end{cases}$$