

§4.5 (PART 1): SIMPLEX ALGORITHM

- 1.] REDDY MIKKS COMPANY: Recall the Reddy Mikks company once again. Below the LP is in standard form. Follow the steps below to solve this problem using the Simplex Algorithm.

$$\text{Maximize: } z = 5x_1 + 4x_2$$

$$\begin{aligned} \text{Subject to: } 6x_1 + 4x_2 + s_1 &= 24 \\ x_1 + 2x_2 + s_2 &= 6 \\ -x_1 + x_2 + s_3 &= 1 \\ x_2 + s_4 &= 2 \\ x_1, x_2, s_1, s_2, s_3, s_4 &\geq 0 \end{aligned}$$

- a.) Letting x_1 and x_2 be the nonbasic variables, set up the initial Simplex Tableau in the table below.

Row	Basic	z	x_1	x_2	s_1	s_2	s_3	s_4	RHS
0	z								
1	s_1								
2	s_2								
3	s_3								
4	s_4								

- b.) Identify the *entering variable* and highlight the *pivot column*. Why is this the entering variable?

- c.) Determine the *pivot row* and the *pivot element* by identifying the *leaving variable*, which is determined by the *ratio test*:

Entering		
Basic	RHS	Ratio
s_1		
s_2		
s_3		
s_4		

- d.) Construct the new pivot row by renaming the leaving variable as the entering variable and dividing the entire row by the pivot element.

e.) Construct the new rows:

- Construct Row 0':

- Construct Row 2':

- Construct Row 3':

- Construct Row 4':

f.) Assemble the Simplex Tableau. The first iteration is complete.

Row	Basic	z	x_1	x_2	s_1	s_2	s_3	s_4	RHS
0'	z								
1'									
2'									
3'									
4'									

g.) Examine the tableau and determine the current value of the objective function. Is it optimal? If not, identify the next entering variable.

h.) Determine the leaving variable, pivot row, and pivot element by performing the ratio test:

Entering		
Basic	RHS	Ratio
x_1		
s_2		
s_3		
s_4		

i.) Construct the new pivot row by renaming the leaving variable as the entering variable and dividing the entire row by the pivot element.

j.) Construct the new rows:

- Construct Row 0':

- Construct Row 1':

- Construct Row 3':

- Construct Row 4':

k.) Assemble the Simplex Tableau. The second iteration is complete.

Row	Basic	z	x_1	x_2	s_1	s_2	s_3	s_4	RHS
0''	z								
1''									
2''									
3''									
4''									

l.) Examine the tableau and determine the current value of the objective function. Report the optimal solution and the maximum objective function value.

m.) Below is the feasible space of the Reddy Mikks problem. Identify the path for which the Simplex Algorithm found the optimal solution.

