Simplex Solver

October 16, 2020

Problem

Given the following linear system and objective function, find the optimal solution.

$$\max x_1 - x_2 + 2x_3 - -2x_4 + 3x_5 - -3x_6 + 4x_7 - -4x_8$$

$$\begin{cases} x_1 - x_2 + x_3 - x_4 + x_5 - x_6 + x_7 - x_8 \leq 5 \\ x_1 - x_2 - x_3 + x_4 \leq -3 \\ -x_5 + x_6 + x_7 - x_8 \leq 6 \end{cases}$$

Solution

Add slack variables to turn all inequalities to equalities.

$$\begin{cases} x_1 - x_2 + x_3 - x_4 + x_5 - x_6 + x_7 - x_8 + s_1 = 5 \\ x_1 - x_2 - x_3 + x_4 + s_2 = -3 \\ -x_5 + x_6 + x_7 - x_8 + s_3 = 6 \end{cases}$$

Create the initial tableau of the new linear system.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	s_1	s_2	s_3	b
1	-1	1	-1	1	-1	1	-1	1	0	0	5
1	-1	-1	1	0	0	0	0	0	1	0	-3
0	0	0	0	-1	1	1	-1	0	0	1	6
-1	1	-2	2	-3	3	-4	4	0	0	0	0
$endarray$											