Advanced Optimization - Assignment 6

1. Write a Matlab/Octave function that implements the basic Simplex method for a linear problem given in the standard form. This function must take as arguments: the cost vector c and the equality constraint coefficients A and b. The function must return the optimal point x. At each iteration, the function must print the basis and the value of the objective function. If the problem is detected to be unbounded, the function must print an error message. In order to implement this function, you must also make the following decisions:

    (a) How to choose the entering index.

    (b) How to choose the initial basis.

2. Consider the following linear program:

$$\min\ -5x_1 - x_2$$

    subject to

$$
\begin{aligned}
x_1 + x_2 &\leq 5, \\
2x_1 + \tfrac{1}{2}x_2 &\leq 8, \\
x &\geq 0.
\end{aligned}
$$

    (a) Add slack variables x_3 and x_4 to convert this problem to the standard form.

    (b) Solve this problem by hand using the simplex method, showing at each step the basis and the vectors x_B, λ, and s_N, and the value of the objective function.

    (c) Solve the problem using the function implemented in the first exercise. Did your implementation follow the same path as you did?