Name: _____

MATH 108
Spring 2023
HW 16: Due 05/01

"Everyday life is like programming, I guess. If you love something, you can put beauty into it."

–Donald Knuth

Problem 1. (10pt) Write down the initial simplex tableau for the following optimization problem:

$$\begin{gathered}\max z = 3.1x_1 - 4.7x_2 + 5.9x_3 \\ 1.1x_1 - 5.7x_2 + 4.0x_3 \leq 10.4 \\ 6.7x_1 - 0.8x_2 - 8.8x_3 \geq -8.8 \\ -9.1x_1 + 7.3x_2 - 9.1x_3 \leq 11.7 \\ x_1, x_2, x_3 \geq 0\end{gathered}$$

Problem 2. (10pt) Suppose that the final simplex tableau associated to a maximization problem was the following:

$$\begin{array}{rrrrrrrrr}
1 & 1.77 & 0 & 0 & 0.74 & 0 & 0.26 & 0.29 & 208.57 \\
0 & 0.57 & 0 & 1 & 0.14 & 0 & -0.14 & 0.29 & 28.57 \\
0 & 2.51 & 0 & 0 & 0.83 & 1 & 1.17 & -0.14 & 605.71 \\
0 & 0.09 & 1 & 0 & -0.03 & 0 & 0.03 & 0.14 & 34.29 \\
0 & 3 & 0 & 0 & 2 & 0 & 0 & 2 & 600
\end{array}$$

(a) How many inequalities were considered?

(b) How many variables were there in the original inequalities?

(c) How many slack/surplus variables were introduced?

(d) What was the solution to this maximization problem?

Problem 3. (10pt) Find the dual problem to the minimization problem below.

$$\begin{gathered}\min z = 2x_1 + 6x_2 \\ 6x_1 + 5x_2 \leq 10 \\ x_1 + 3x_2 \leq 9 \\ x_1, x_2 \geq 0\end{gathered}$$