Principles of Optimization (Fall 2024): Homework 7

- There are four problems, and the total points (given in parentheses) add up to 95. You will be graded for 90 points (with the possibility of getting up to 5 points as extra credit).
- **You must submit your homework by email as follows:**
  - **You must email your submission as a PDF file to kbala@wsu.edu**. You are welcome to write answers by hand, and scan the writings (or take pictures of your writings) into a **PDF file**.
  - **Your file name should identify you in this manner: If you are Tolkien Black, say, you should name your submission TolkienBlack_Math364_Hw7.pdf. Please avoid white spaces in the file name (use "_" or "-" instead).**
  - **Begin the SUBJECT of your email submission with the same `FirstnameLastname`, expression, e.g., "TolkienBlack Math364 Hw7 submission".**
- **This homework is due by 5:00 PM on Tuesday, October 22.**

1. (20) Solve the following LP using the big-M simplex method.

$$\begin{array}{lrcl} \max\ z = & 3x_1 + x_2 & & \\ \text{s.t.} & x_1 + x_2 & \geq & 3 \\ & 2x_1 + x_2 & \leq & 4 \\ & -x_1 - x_2 & = & -3 \\ & x_1,\ x_2 & \geq & 0 \end{array}$$

2. (25) Solve the following LP using the big-M simplex method.

$$\begin{array}{lrcl} \min\ z = & -2x_1 + x_2 & & \\ \text{s.t.} & 3x_1 + x_2 & \leq & 6 \\ & -2x_1 - x_2 & \leq & 4 \\ & x_1 \geq 0, x_2 & \text{urs} & \end{array}$$

3. (25) Solve the following LP using the big-M simplex method (*yes, the problem is trivial; but the point here is to use the big-M method*). Are there alternative optimal solutions? How many optimal bfs's are there?

$$\begin{array}{lrcl} \min\ z = & 2x_1 + 2x_2 & & \\ \text{s.t.} & x_1 + x_2 & = & 2 \\ & 3x_1 + 3x_2 & = & 6 \\ & 4x_1 + 4x_2 & = & 8 \\ & x_1,\ x_2 & \geq & 0 \end{array}$$

4. (25) Solve the following LP using the big-M simplex method.

$$\begin{array}{lrcl} \min & x_1 + x_2 + x_3 & & \\ \text{s.t.} & x_1 + 2x_2 + 3x_3 & = & 3 \\ & -x_1 + 2x_2 + 6x_3 & = & 2 \\ & 4x_2 + 9x_3 & = & 5 \\ & 3x_3 + x_4 & = & 1 \\ & x_1, x_2, x_3, x_4 & \geq & 0 \end{array}$$