Principles of Optimization (Fall 2024): Homework 11

- There are **four problems**, and the total points (given in parentheses) add up to 110. You will be graded for 105 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 Jimbo Kern, say, you should name your submission JimboKern_Math364_Hw11.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., "JimboKern Math364 Hw11 submission".**

- **This homework is due by 5:00 PM on Thursday, November 21.**

1. (25)   In the basketball starting line-up selection problem (discussed in Lecture 25), how will you model the following situation?

   if players 2 and 3 both start, then player 5 must start.

   Explain why your formulation works as intended.

2. (20)   Model the following statement: *either $x + 2y \leq 4$ or $4x + 9y \leq 10$ or both hold*.

3. (30)   Generalizing the previous problem, how will you model the following statement?

   either $x + 2y \leq 4$ or $4x + 9y \leq 10$ or $5x + 13y \leq 15$ or all three hold.
   In other words, you want exactly one of the three options to hold, or all three of them—but not two of them.

4. (35)   Model the following statement using extra binary variables and M (big-M):

   $$\text{if } |x + y| < 3 \text{ then } |2x - 3y| \geq 6.$$

   Do *not* assume that x, y are integers. $|x|$ stands for the absolute value of x.