Operations Research, Spring 2016

Pre-lecture Problems for Lecture 2: Introduction to Linear Programming

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Note. The deadline of submitting the pre-lecture problem is ***9:20am, March 3, 2015***. Please submit a hard copy of your work to the instructor in class. Late submissions will not be accepted. Each student must submit her/his individual work. Submit ONLY the problem that counts for grades.

1. (0 point) Graphically solve the following LP:

$$\begin{aligned} \max \quad & 5x_1 + 3x_2 \\ \text{s.t.} \quad & x_1 + x_2 \leq 16 \\ & x_1 + 4x_2 \leq 20 \\ & 2x_1 + x_2 \geq 6 \\ & x_1 \geq 0, x_2 \geq 0. \end{aligned}$$

2. (0 point) Bob is the owner of a furniture shop. He uses woods to make tables and chairs. Each day, he buys woods from his supplier at a cost of \$50 per unit. Each table requires 2 units of woods while each chair requires 1 unit. He, as well as his employees, needs to spend time on making these products. He can make 1 chair or 0.5 table in 1 hour. Each of his two employees, who are not as experiences as him, can make 0.8 chair or 0.3 tables in 1 hour. The outputs are always proportional to the amount of time they spend. Each of the two employees works 8 hours per day. Bob can work 12 hours per day. A table can be sold at \$200 and a chair can be sold at \$80. Formulate an LP that can find a production plan for Bob to maximize his daily profit.

3. (10 points) Tom is the owner of a furniture shop. He uses woods to make tables and chairs. Each day, he buys woods from his supplier at a cost of \$30 per unit. The maximum amount of woods that may be purchased is 10 units. Each table requires 3 units of woods while each chair requires 2 units. He needs to spend time on making these products. He can make 1 chair or 0.5 table in 1 hour. The outputs are always proportional to the amount of time they spend. Tom can work 12 hours per day. A table can be sold at \$120 and a chair can be sold at \$80.

   (a) (5 points) Formulate an LP that can find a production plan for Tom to maximize his daily profit.

   (b) (5 points) Graphically solve the LP. Interpret your solution to make a suggestion to Tom.

   Note. You are required to formulate a "linear program." Double check whether your program is really a linear one!