Operations Research, Spring 2017

Pre-lecture Problems for Lecture 5: Applications of Linear Programming

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Note. The deadline of submitting the pre-lecture problem is ***9:20am, March 16, 2017***. Please submit a hard copy of your work 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) Mary uses chemicals 1 and 2 to produce two drugs. Drug 1 must be at least 60% chemical 1. For example, blending 11 oz of chemical 1 and 9 makes there only $\frac{11}{11+9} = 55\%$ of chemical 1, which does not make the produced drug 1 of the required quality. For drug 2, there must be at least 50% chemical 2. Up to 100 oz of drug 1 can be sold at \$6 per oz; up to 90 oz of drug 2 can be sold at \$5 per oz. Up to 130 oz of chemical 1 can be purchased at \$6 per oz, and up to 80 oz of chemical 2 can be purchased at \$4 per oz. Formulate an LP that can be used to maximize Mary's profits.

2. (0 point) Linearize the following LP

$$\begin{aligned} \max \quad & 5\min\{x_1, x_2\} + 3x_2 \\ \text{s.t.} \quad & \max\{x_1, x_2\} \leq 16 \\ & x_1 + 4x_2 \leq 20 \\ & x_2 \geq 8 \\ & x_1 \geq 0, x_2 \geq 0. \end{aligned}$$

3. (10 points) Linearize the following LP

$$\begin{aligned} \max \quad & 5\min\{x_1, x_2 + x_3\} - 3\max\{x_2, x_1 + x_3\} \\ \text{s.t.} \quad & x_1 \geq |16 - x_1| \\ & \min\{x_1, x_2 + 4\} \geq \max\{x_1, 4x_2 - x_3, 6\} \\ & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0. \end{aligned}$$