Operations Research, Spring 2016
Suggested Solution for Pre-lecture Problems for Lecture 2

Solution providers: Kiwi Liu and Johnny Chen
Department of Information Management
National Taiwan University

1. The graphic solution is shown in Figure 1. We may push the indifference line and find out the optimal solution $(x_1, x_2) = (16, 0)$.

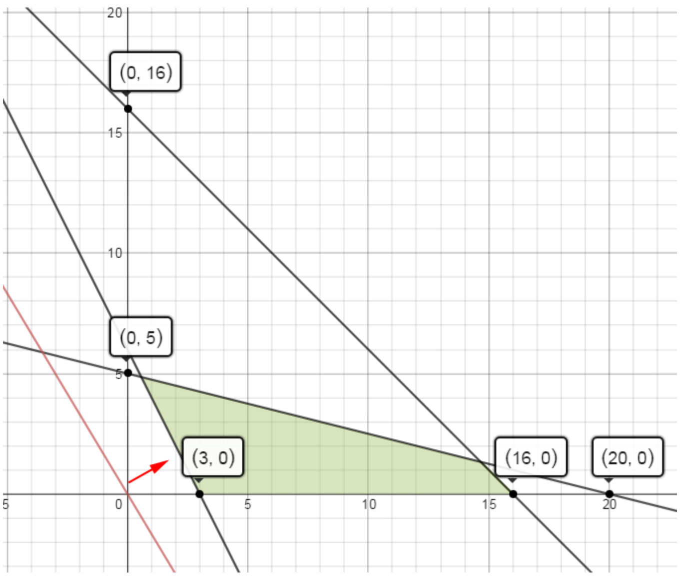

Figure 1: Graphical solution for Problem 1

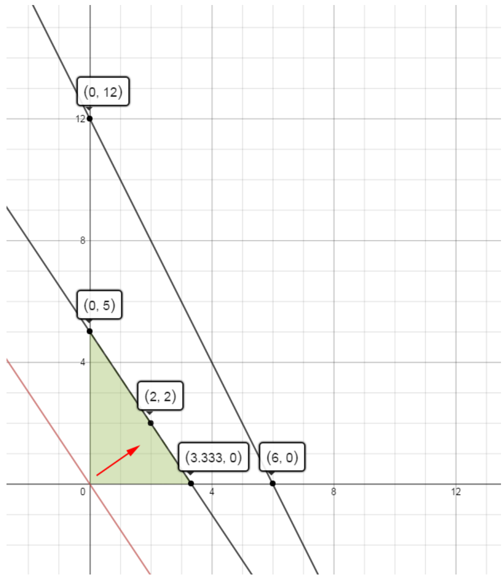

Figure 2: Graphical solution for Problem 3

2. Let x_1 and x_2 be the numbers of tables and chairs produced, respectively. The problem can then be formulated as

$$\begin{aligned} \max \quad & 100x_1 + 30x_2 \\ \text{s.t.} \quad & 2x_1 + x_2 \leq 12 \\ & \frac{5}{4}x_1 + \frac{10}{3}x_2 \leq 16 \\ & x_i \geq 0 \quad \forall i = 1, 2. \end{aligned}$$

3. (a) Let x_1 and x_2 be the numbers of tables and chairs produced, respectively. The problem can then be formulated as

$$\begin{aligned} \max \quad & 120x_1 + 80x_2 - 30(3x_1 + 2x_2) \\ \text{s.t.} \quad & 3x_1 + 2x_2 \leq 10 \\ & \frac{1}{0.5}x_1 + x_2 \leq 12 \\ & x_i \geq 0 \quad \forall i = 1, 2. \end{aligned}$$

   (b) The graphical solution is shown in Figure 2. Since the objective function is parallel with the constraint $3x_1 + 2x_2 \leq 10$, there are multiple optimal solutions to the LP on the line segment. Two optimal solutions, e.g., are $(x_1, x_2) = \{(0, 5), (2, 2)\}$. Therefore, we suggest Tom to produce either 0 table and 5 chairs or 2 tables and 2 chairs per day.