STOR 415, Fall 2019
Solutions to Homework Assignment No. 1

1. (a) Formulate an LP to maximize Furnco's profit.

$$\begin{array}{lll} \text{maximize} & z = & 40x_1 + 25x_2 \\ \text{subject to} & & \\ & & \begin{array}{lll} 4x_1 + 3x_2 & \leq & 20, \\ 2x_1 - x_2 & \leq & 0, \\ x_1 & \geq & 0, \\ x_2 & \geq & 0. \end{array} \end{array}$$

   (b) Is $(0, 0)$ a feasible solution? Yes

   (c) Is $(-3, 2)$ a feasible solution? No

   (d) Is $(2, 4)$ a feasible solution? Yes

2. For $i = 1, 2, 3$, let x_i be the number of pig valves from supplier i.

$$\begin{array}{lll} \text{minimize} & z = & 5x_1 + 4x_2 + 3x_3 \\ \text{s.t.} & & \\ & & \begin{array}{lll} 0.4x_1 + 0.3x_2 + 0.2x_3 & \geq & 500, \\ 0.4x_1 + 0.35x_2 + 0.2x_3 & \geq & 300, \\ 0.2x_1 + 0.35x_2 + 0.6x_3 & \geq & 300, \\ x_1, x_2, x_3 & \leq & 700, \\ x_1, x_2, x_3 & \geq & 0. \end{array} \end{array}$$

3. Let x_{ijg} be the number of students in grade g of school j from neighborhood i.

$$\begin{array}{lll} \text{minimize} & z = \sum_{i=1}^{I} \sum_{j=1}^{J} \sum_{g=1}^{G} d_{ij} x_{ijg} & \\ \text{subject to} & \sum_{j=1}^{J} x_{ijg} = S_{ig}, & i = 1, \cdots, I, g = 1, \cdots, G \\ & \sum_{i=1}^{I} x_{ijg} \leq C_{jg}, & j = 1, \cdots, J, g = 1, \cdots, G \\ & x_{ijg} \geq 0, & i = 1, \cdots, I, j = 1, \cdots, J, g = 1, \cdots, G. \end{array}$$