Operations Research

Homework 2

Due in class Wednesday, September 21, 2016

1. Find an equation for the plane that contains the point $\boldsymbol{p} = (2, 4, 6)$ and the line

$$\boldsymbol{x} = \begin{pmatrix} 7 \\ 3 \\ 5 \end{pmatrix} + \lambda \begin{pmatrix} -3 \\ 4 \\ 2 \end{pmatrix} .$$

2. Find all solutions for the underdetermined linear system $A\boldsymbol{x} = \boldsymbol{b}$, where

$$A = \begin{pmatrix} 2 & 2 & 1 & 0 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 0 & -1 \\ 3 & 3 & 2 & 1 \end{pmatrix} \qquad \text{and} \qquad \boldsymbol{b} = \begin{pmatrix} -1 \\ 1 \\ -2 \\ 0 \end{pmatrix} .$$

3. Reconsider Problem 1 from Homework Set 1:

   Minimize

$$z = 8\,x + 12\,y$$

   subject to

$$\begin{gathered} 5\,x + 2\,y \geq 20\,, \\ 4\,x + 3\,y \geq 24\,, \\ y \geq 2\,, \\ x, y \geq 0\,. \end{gathered}$$

   (a) Write a "concrete" Pyomo model and resolve this problem.

   (b) How does the solution change if you ask for maximizing z instead?

   You should submit a printout of your Ipython notebook which shows the model setup and the computed solutions to (a) and (b).