

Operations Research

Homework 2

Due in class Tuesday, September 19, 2017

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

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

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

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

3. Reconsider Problem 1 from Homework Set 1: *Minimize*

$$z = 8x + 12y$$

subject to

$$5x + 2y \geq 20,$$

$$4x + 3y \geq 24,$$

$$y \geq 2,$$

$$x, y \geq 0.$$

Introduce slack variables to write this linear programming problem in the standard form: *Minimize*

$$z = \mathbf{c}^T \mathbf{x}$$

subject to

$$A\mathbf{x} = \mathbf{b}$$

$$\mathbf{x} \geq 0$$

where the coefficients \mathbf{b} , \mathbf{c} , and the decision variables \mathbf{x} are written as column vectors, and A is a matrix of matching dimension.