Assignment 1

Post Date: 25 April 2014   **Due Date:** 2 May 2014   **Tutorial:** 7 May 2014
You are permitted and encouraged to work in groups of two.

Problem 1: Linear Programming Example   5 Points

Solve the following linear program graphically.

$$\text{maximize} \quad x_1 + 2x_2$$

subject to

$$
\begin{array}{rcrcl}
-x_1 & + & x_2 & \leq & 2 \\
     &   & x_2 & \leq & 3 \\
x_1 & - & x_2 & \leq & 3 \\
x_1 & + & x_2 & \leq & 5 \\
x_1 & + & x_2 & \geq & -1
\end{array}
$$

Problem 2: Equivalent Forms   7 Points

Transform the following linear program

$$\text{minimize} \quad 2x_1 - 6x_3$$

subject to

$$
\begin{array}{rcrcrcl}
x_1 & + & x_2 & - & x_3 & \leq & 7 \\
3x_1 & - & x_2 &   &   & = & 8 \\
-x_1 & + & 2x_2 & + & 2x_3 & \geq & 0 \\
     &   &   &   & x_1, x_3 & \geq & 0
\end{array}
$$

(a) into standard form.

(b) into slack form.

Problem 3: Shortest Path as Linear Program   8 Points

In Assignment 0, you learned about Dijkstra's Algorithm to calculate shortest paths in a directed graph $G = (V, E)$ with non-negative edge-weights. Formulate a linear program that solves the problem.