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.

maximize \( x_1 + 2x_2 \)

subject to

\[
\begin{align*}
-x_1 + x_2 & \leq 2 \\
x_2 & \leq 3 \\
x_1 - x_2 & \leq 3 \\
x_1 + x_2 & \leq 5 \\
x_1 + x_2 & \geq -1 
\end{align*}
\]

Problem 2: Equivalent Forms  7 Points

Transform the following linear program

minimize \( 2x_1 - 6x_3 \)

subject to

\[
\begin{align*}
x_1 + x_2 - x_3 & \leq 7 \\
3x_1 - x_2 & = 8 \\
-x_1 + 2x_2 + 2x_3 & \geq 0 \\
x_1, x_3 & \geq 0
\end{align*}
\]

(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.