Homework, Operations Research

Homework for the middle of Chapter 3

1. Consider the following linear program:

$$
\begin{array}{rlrll}
\max & z = & 3x+ & y & \\
\text{s.t.} & & 4x+ & y & \leq 16 \\
& & x+ & y & \leq 7 \\
& & x & & \geq 0 \\
& & & y & \geq 0
\end{array}
$$

(a) Solve the linear program geometrically. That is, draw the feasible set in the plane, and draw a couple of isoprofit lines.

(b) Solve the LP using spreadsheet software- Either Excel or LibreOffice.

(c) Change the objective function (in the original LP) so that you have an infinite number of solutions to the LP. Verify your answer geometrically.

(d) Add a constraint to the original LP so that there is no solution. Verify your answer geometrically.

2. This exercise is to get you to think about the difference between an unbounded feasible set and an unbounded LP. Consider the following LP:

$$
\begin{array}{rlrll}
\min & z = & x+ & y & \\
\text{s.t.} & & 7x+ & 4y & \geq 28 \\
& & 5x+ & 6y & \geq 30 \\
& & x & & \geq 0 \\
& & & y & \geq 0
\end{array}
$$

(a) Is the feasible set unbounded? Show geometrically.

(b) Is the LP unbounded?

(c) If I change the objective function to a maximization problem (that is, change the word "min" to "max"), is the LP unbounded?

(d) If I have a bounded feasible set for a linear program, is it possible to have an unbounded LP?

(e) If I have an unbounded feasible set for a linear program, is it possible to have a bounded LP?