Visualizing the Linear Programming Problems from 7.6 in 3-d.

When thinking about the problems from 7.6, I find it useful to have a 3-d picture in my head. In my picture, I see the x-y plane below (as if it were parallel to the earth) and another plane – above it. This plane is not parallel with the earth. Instead it varies in height at different places and the height gives the z-value of the (x,y) point below it.

This is probably easiest to see as a problem with pictures:

Suppose we have the region:

$$0 \leq y$$
$$x \leq 4$$
$$y \leq \frac{3}{2}x$$

Graphically, it looks like this:
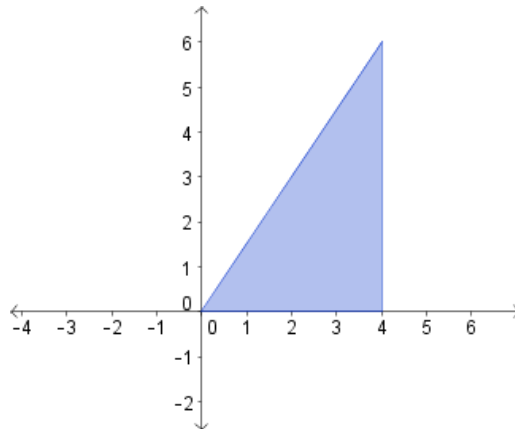
It has corner points (0,0), (4,6), and (4,0).

Now we consider the function: $z = \frac{3}{4}x - \frac{1}{2}y$. Z is a function of two variables, x and y. It is linear because there both the x and y terms are first degree polynomials. This means that it is a plane. I imagine it a bit like a "tent" or "canopy" above the bounded region. The goal of this problem is to find where the canopy is lowest and highest.

On the next page, you can see a 3-d picture of this problem.
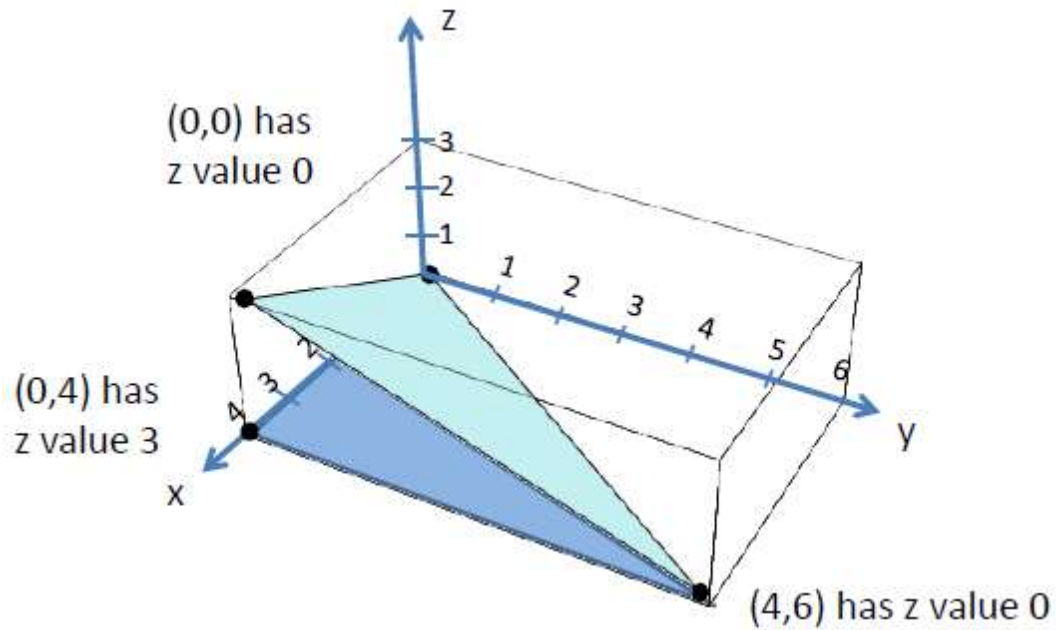
This link lets you model linear programming problems in 3-d. It took me a few minutes to figure out how to change the equations, but once I got the hang of it, I really appreciated "seeing" the picture behind the problem.

http://www.teacherlink.org/content/math/interactive/flash/linearprogramming/linearprogramming.html