Mathematical Programming	Homework 6
OR 630 Fall 2005	Due October 21, 2005

1. Solve the following small LP problem by the revised simplex method, starting with the all-slack basis, and choosing the variable with the most negative reduced cost to enter the basis at each iteration. Even though it might be more efficient to use a tableau method for such a small problem, exhibit all the quantities that the revised simplex maintains and updates at each iteration.

$$\begin{array}{rrcrcrcrcl} \min_x & -6x_1 & - & 7x_2 & & & & & & \\ & x_1 & + & 2x_2 & + & x_3 & & & = & 8, \\ & 3x_1 & + & x_2 & & & + & x_4 & = & 9, \\ & & & & & & & x & \geq & 0. \end{array}$$

2. Consider the problem in the notes of September 22nd., with $c_1 = 4$. Then the optimal solution is $\bar{x} = (1; 2; 0; 0; 0; 1)$.

a) Suppose foods 1 and 3 are reformulated, so they provide amounts $1\frac{2}{3}$ and $1\frac{1}{3}$ of nutrient per unit respectively. Check whether the same set of basic indices as in the nominal optimal solution above provides an optimal basic feasible solution to this revised problem.

b) Now suppose the reformulation can be adjusted, so that the amounts of nutrient 2 provided by one unit of food 1 (food 3) becomes $1 + 2\lambda$ ($1 + \lambda$, respectively). (Part (a) had $\lambda = \frac{1}{3}$.) Try to find the range of possible λ's (negative as well as positive) so that the same set of basic indices as in the nominal optimal solution above provides an optimal basic feasible solution to this revised problem.

(This is a little tricky. You may have to consider a few cases.)