MthSc 440/640 Problem Set #6

Due 3/2/12

1. Consider the following LP problem (P):

$$
\begin{array}{llrl}
\min & z = 20x_1 + 12x_2 & + 4x_4 + 19x_5 + 8x_6 + 13x_7 & \\
\text{s.t.} & x_1 + x_2 & + x_4 + 3x_5 - 3x_6 - 4x_7 & = 7 \\
 & 3x_1 + \quad - x_3 & - 10x_4 - 7x_5 + 15x_6 + 10x_7 & = 8 \\
 & x_1 + & - 2x_4 - 4x_5 + 4x_6 + 5x_7 & = 3 \\
 & & x_1, x_2, x_3, x_4, x_5, x_6, x_7 & \geq 0
\end{array}
$$

Let the current basis matrix be $\mathbf{B} = [a_1, a_2, a_3]$.

(a) Verify that $\mathbf{B}$ defines an optimal solution $\mathbf{x} = (x_1, x_2, \ldots, x_7)$ to (P).

Answer parts (b)–(f) independently of one another.

(b) Determine the (largest) interval for c_1 so that the original basis $\mathbf{B}$ remains optimal.

(c) Determine the (largest) interval for c_5 so that the original basis $\mathbf{B}$ remains optimal.

(d) Determine the (largest) interval for b_3 so that the original basis $\mathbf{B}$ remains optimal.

(e) Suppose that c_1 is changed to 15. Determine the new optimal solution $\mathbf{x}$.

(f) Suppose that b_3 is changed to 2. Determine the new optimal solution $\mathbf{x}$.

In your calculations above, do not compute inverses; rather solve the necessary linear equations.