Homework 8

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November 22, 2010

6.1

a) plug in $x_2=3$ and subtract over to get $x' = (13, 3, 26, 0, 0, 27, 2)$

b) No, 2nd constraint cannot be fulfilled

c) $5 - x_2 \geq 0 \implies x_2 \leq 5$

$5 - 2x_4 \geq 0$ $\quad x_4 \leq 5/2$

$5 - 3x_5 \geq 0$ $\quad x_5 \leq 5/3$

$5 - x_7 \geq 0$ $\quad x_7 \leq 5$

d) set $x_4 = 1$ and subtract, resulting in $x_1 = 12$ with optimal vector $x' = (12, 0, 21, 1, 0, 31, 3)$

e) Vector in part d had $x_3 = 21$, so that is the sol'n

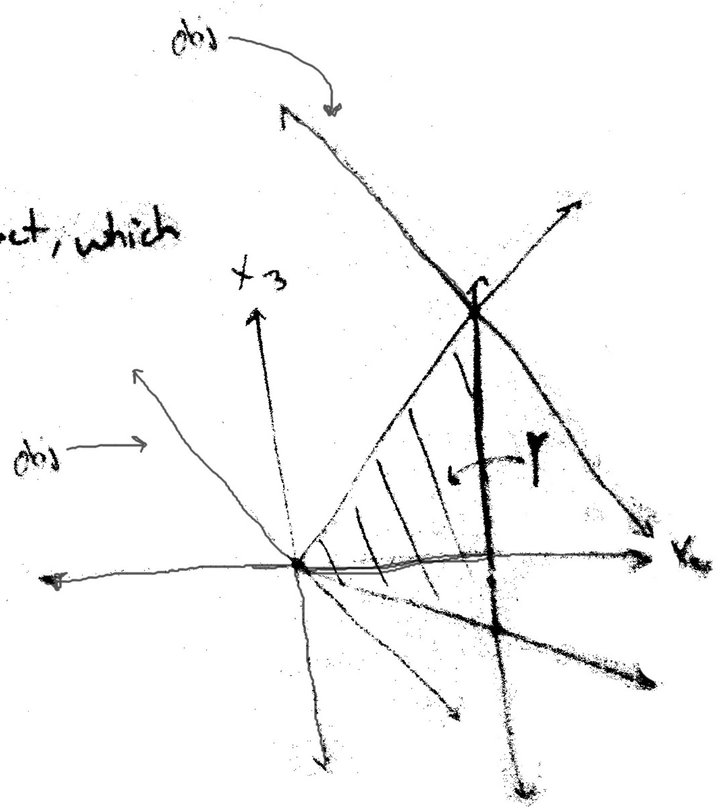
6.2

a) Set $x_2 = 5$ and subtract, which gives $x^T = (15, 5, 0, 5)$

b)

c)

d)



6.3

a) $(10, 10, 0, 0) = X^T$

b) $Q = \begin{bmatrix} 1 & 0 & 3 & 1 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & -1 \\ 0 & 0 & -1/2 & 1 \end{bmatrix}$

c) \$3 ea. so \$24 total

d) Make S_2 basic, then set to 22 by forcing x_4 to be 3. New revenue is only \$111, so to get back to \$150, we sell the 22 resources for \$39.

e) Set $x_3 = 10$ and subtract column. New vector is $(10, 5, 10, 0) = X^T$

f) Make that shit basic and proceed normally. force $s_2 = 5$ and subtract that col. X_3 ~~was~~ $= 5$. Vector is $(5, 0, 25, 0) = X^T$

g) The only column that changes is the constants column in the new optimal tableau, so we can just left multiply the new column by Q to get the constant col. of optimal form

$$Q\begin{bmatrix}0\\50\\40\\25\end{bmatrix} = \begin{bmatrix}145\\25\\15\\5\end{bmatrix} = \text{constant column.}$$

So, new optimal vector is $(15,5,0,0) = X^T$

h) Same deal, multiple new constant column by Q.

$$Q\begin{bmatrix}0\\50\\40\\35\end{bmatrix} = \begin{bmatrix}155\\15\\5\\15\end{bmatrix} = \text{constant column}$$

So, new optimal vector is $(5,15,0,0) = X^T$

l) Just like before, we can left multiply the new constant column by Q to get that col for optimal form.

$$Q\begin{bmatrix}60\\30\\20\end{bmatrix} = \begin{bmatrix}110\\40\\10\\5\end{bmatrix} = \text{constant column}$$

So, new optimal vector is $(10, 5, 0, 0) = x'$

m) $$Q^{-1} = \begin{bmatrix}1 & 0 & -7 & -8\\ 0 & 1 & 1 & 2\\ 0 & 0 & 2 & 2\\ 0 & 0 & 1 & 2\end{bmatrix}$$