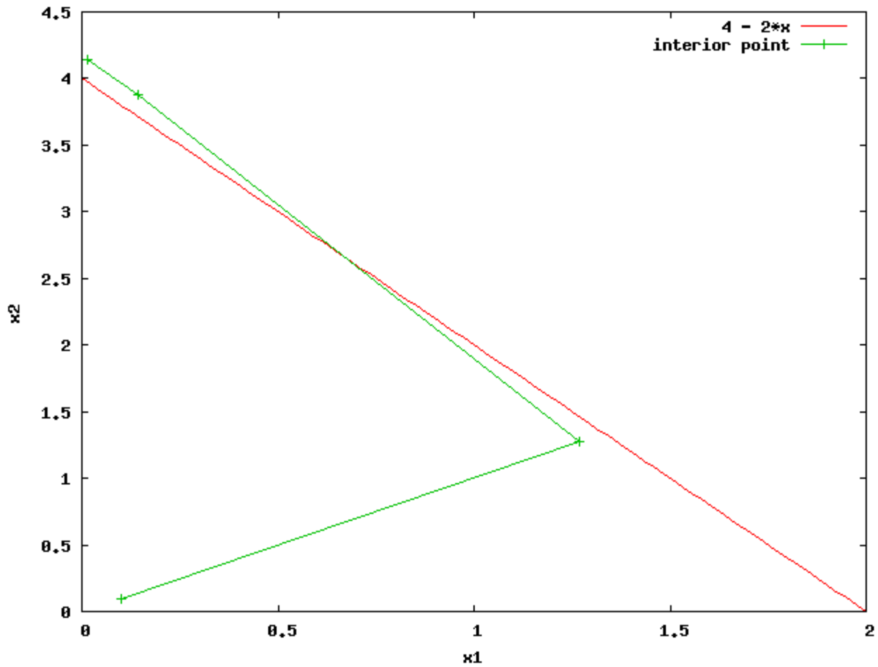
Matt Jibson
EG 510
HW 11

1. (a) Graphical solution: $x_1 = 0, x_2 = 4, -x_1 - x_2 = -4$:



(b)

$$\mathbf{x}_0 = \begin{bmatrix} 0.1 \\ 0.1 \\ 3.9 \end{bmatrix}, \mathbf{D} = \begin{bmatrix} 0.1 & 0 & 0 \\ 0 & 0.1 & 0 \\ 0 & 0 & 3.9 \end{bmatrix}, \mathbf{B} = \mathbf{AD} = \begin{bmatrix} 0.2 & 0.1 & 3.9 \end{bmatrix},$$

$$\mathbf{BB}^T = \begin{bmatrix} 15.26 \end{bmatrix}, \mathbf{Dc} = \begin{bmatrix} -0.1 \\ -0.1 \\ 0 \end{bmatrix}, \mathbf{BDc} = \begin{bmatrix} -0.03 \end{bmatrix},$$

$$\mathbf{w} = \begin{bmatrix} -0.001966 \end{bmatrix}, \mathbf{c}_p = \begin{bmatrix} 0.0996 \\ 0.0998 \\ -0.007667 \end{bmatrix}, \theta = 1/0.007667 = 130.43, \alpha = 0.9 \Rightarrow$$

$$\mathbf{x}_1 = \begin{bmatrix} 1.269 \\ 1.272 \\ 0.39 \end{bmatrix}, \mathbf{D} = \begin{bmatrix} 1.269 & 0 & 0 \\ 0 & 1.272 & 0 \\ 0 & 0 & 0.39 \end{bmatrix}, \mathbf{B} = \mathbf{AD} = \begin{bmatrix} 2.538 & 1.272 & 0.39 \end{bmatrix},$$

$$\mathbf{BB}^T = \begin{bmatrix} 8.212 \end{bmatrix}, \mathbf{Dc} = \begin{bmatrix} -1.269 \\ -1.272 \\ 0 \end{bmatrix}, \mathbf{BDc} = \begin{bmatrix} -4.839 \end{bmatrix},$$

$$\mathbf{w} = \begin{bmatrix} -0.5893 \end{bmatrix}, \mathbf{c}_p = \begin{bmatrix} -0.2265 \\ 0.5225 \\ -0.2298 \end{bmatrix}, \theta = 1/0.2298 = 4.352, \alpha = 0.9 \Rightarrow$$

$$\mathbf{x}_2 = \begin{bmatrix} 0.1433 \\ 3.875 \\ 0.039 \end{bmatrix}, \mathbf{D} = \begin{bmatrix} 0.1433 & 0 & 0 \\ 0 & 3.875 & 0 \\ 0 & 0 & 0.039 \end{bmatrix}, \mathbf{B} = \mathbf{AD} = \begin{bmatrix} 0.2866 & 3.875 & 0.039 \end{bmatrix},$$

$$\mathbf{BB}^T = \begin{bmatrix} 15.1 \end{bmatrix}, \mathbf{Dc} = \begin{bmatrix} -0.1433 \\ -3.875 \\ 0 \end{bmatrix}, \mathbf{BDc} = \begin{bmatrix} -15.0567 \end{bmatrix},$$

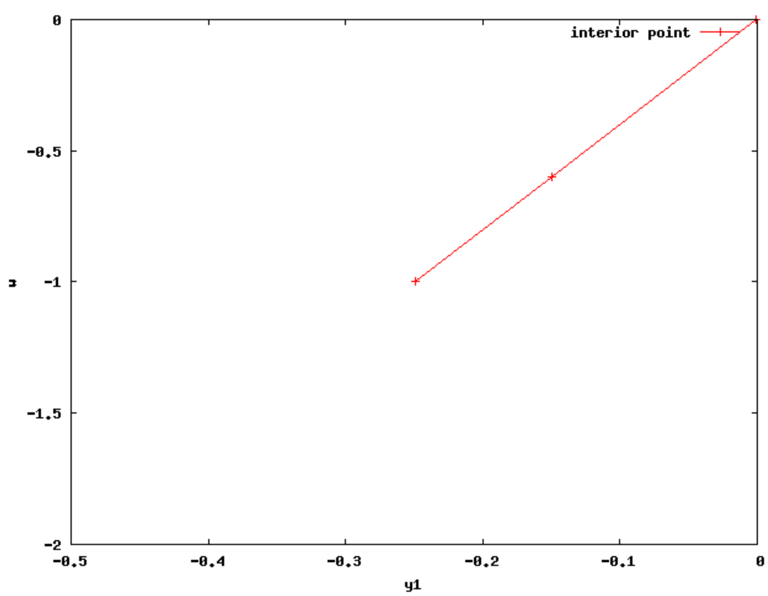
$$\mathbf{w} = \begin{bmatrix} -0.9972 \end{bmatrix}, \mathbf{c}_p = \begin{bmatrix} -0.1425 \\ 0.011 \\ -0.03889 \end{bmatrix}, \theta = 1/0.1425 = 7.018, \alpha = 0.9 \Rightarrow$$

$$\mathbf{x}_3 = \begin{bmatrix} 0.0143 \\ 4.143 \\ 0.0294 \end{bmatrix}$$

On the graph the interior point method is clearly infeasible. Is this due to a calculation or procedure error on my part? Or is it just rounding and sig fig stuff?

(d) Dual is:

$$\begin{array}{ll} \text{maximize} & w = 4y_1 \\ \text{subject to} & 2y_1 \geq -1 \\ & y_1 \geq -1 \\ & y_1 \leq 0 \end{array}$$



Here we see the feasible range is $-0.5 \leq y_1 \leq 0$, and the $\mathbf{w}$'s generated in the affine scaling alrorithm are converging on the dual solution.