Joshua Rinaldi
101902285
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HW 8

Honor Code Pledge:_____

Question 1

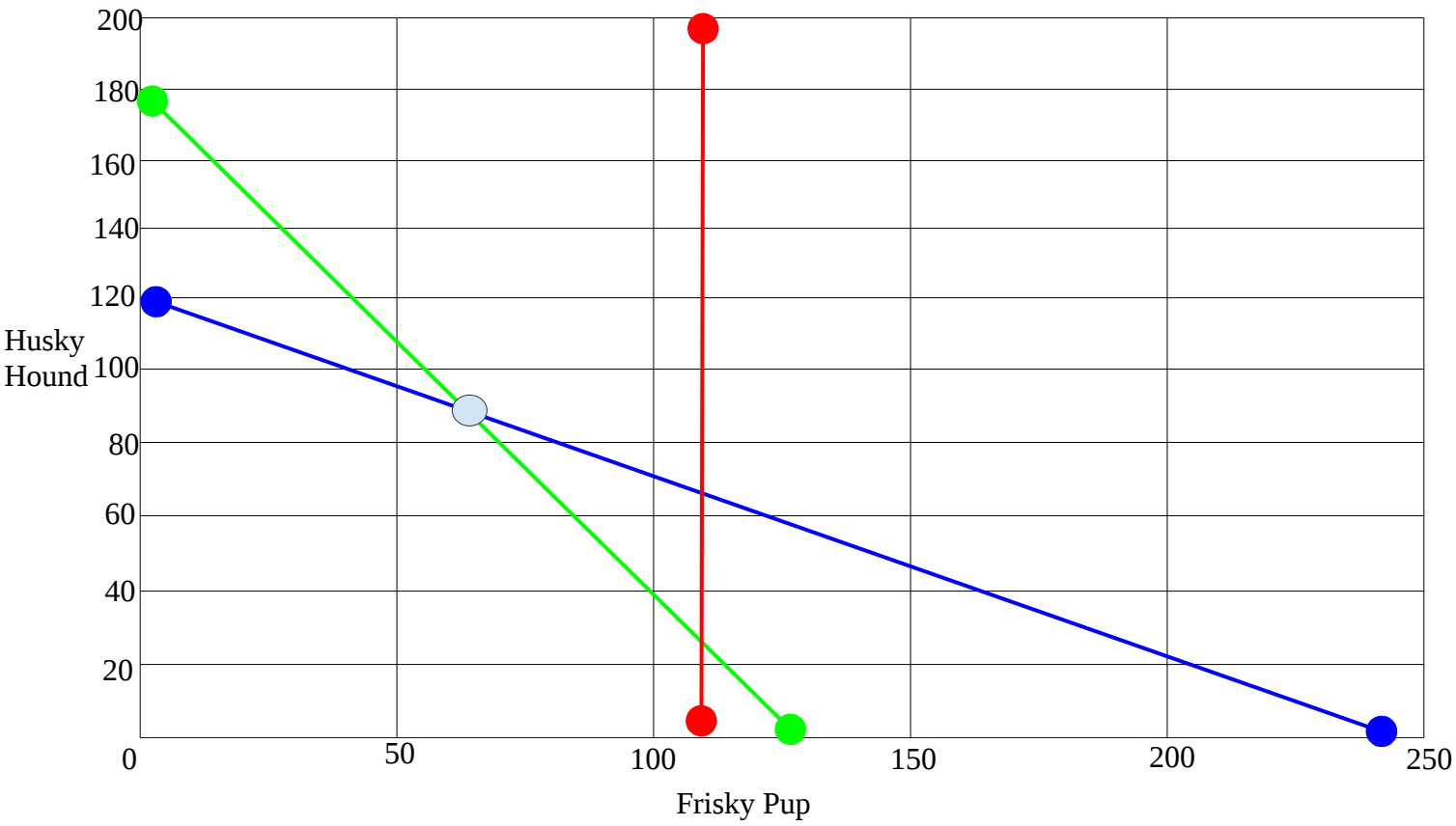
(a)

p = number of bags of Frisky Pup
h = number of bags of Husky Hound
Profit per bag of Frisky Pup = 7-(1+3+1.4) = $1.60
Profit per bag of Husky Hound = 6-(2+2+0.6) = $1.40

Maxime: $1.6p + 1.4h$

$$p+2h \leq 240000$$
$$1.5p+h \leq 180000$$
$$p \leq 110000$$
$$p, h \geq 0$$

(b)



The above graph is on a scale of 1000
Blue Line: $h = -(3/2)p+240$
Green Line: $h = -(1/2)p+120$
Red Line: Max number of p
Light Blue Dot: Optimum (60, 90)

Question 2

For this problem, I used the "Simplex Method Tool" the link I used is:
http://www.zweigmedia.com/RealWorld/simplex.html

There should be 600g of tomatoes, 400g of lettuce, 200g of spinach, 0g of carrots and 0g of oil. This makes for a total of 1200g salad.

Question 3

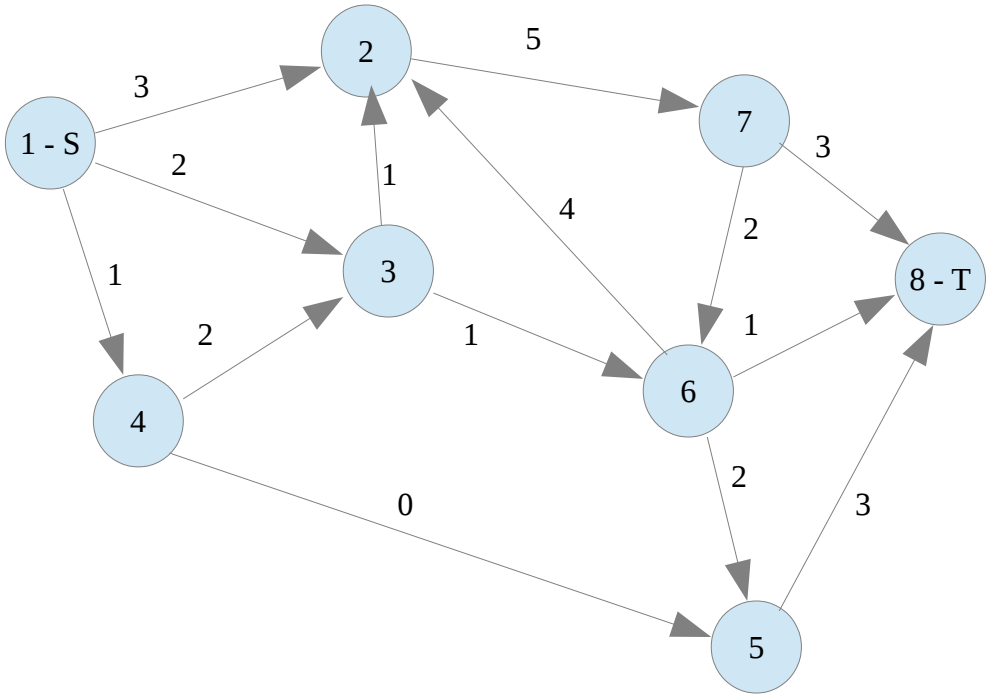
(a)

With zero flow in the network, an augmenting path from the source to the sink would be from node 1 to 4 to 5 to 8, because after flow is put through the network, you would still be residual flow in this path.

(b)

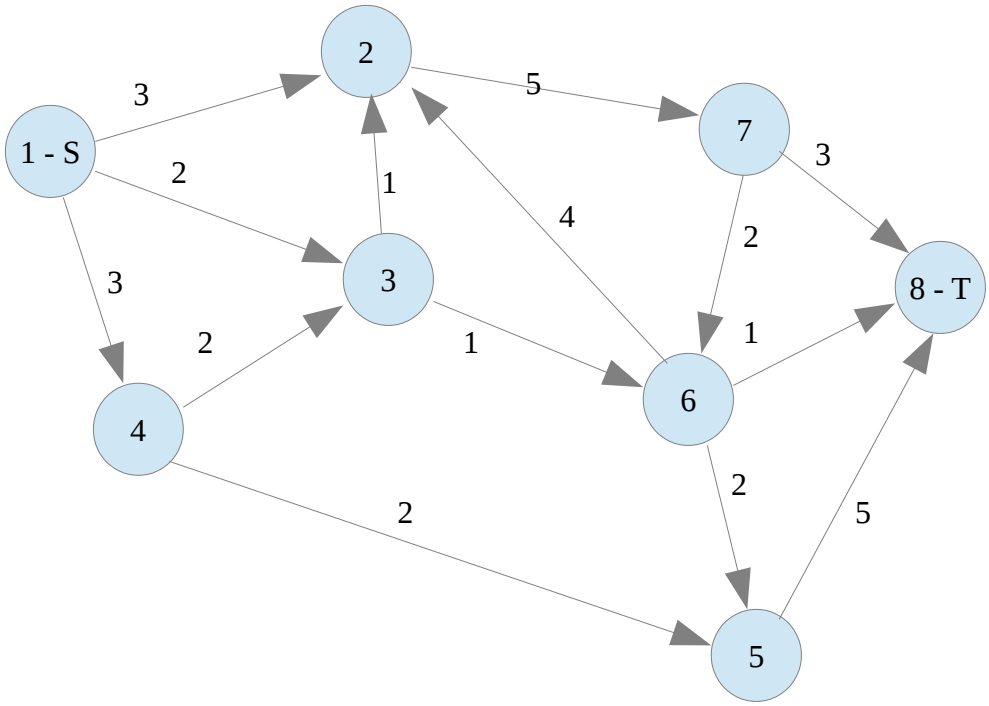
The maximum flow along this path is 2, because that is the max flow of the edge from node 4 to 5.

(c)

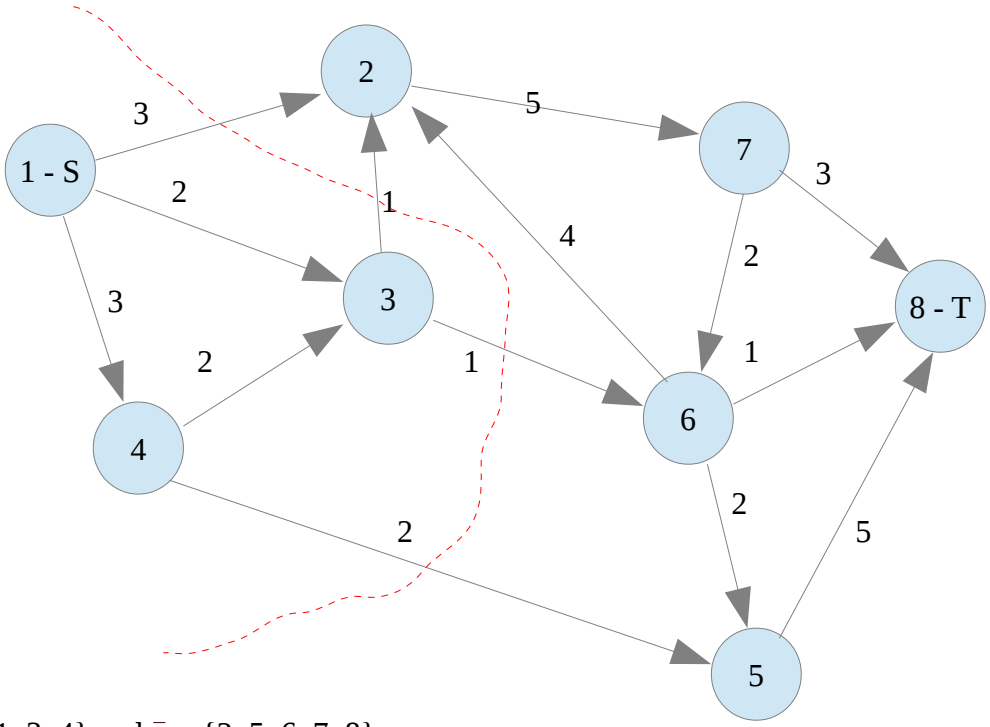


(d)

Given the original graph:



placing a cut along the red dotted line below:



p = {1, 3, 4} and $\bar{p}$ = {2, 5, 6, 7, 8}

The maximum flow that can come out of p is 7.

Question 4

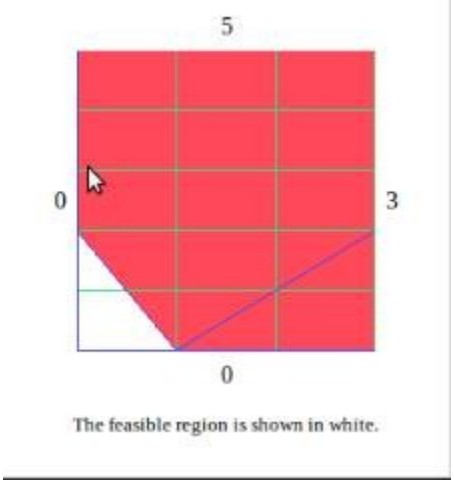
(a)

$Max: 5x_1 - 3x_2$
$x_1 - x_2 \leq 1$
$2x_1 + x_2 \leq 2$
$x_1, x_2 \geq 0$
$max: y_1 + 2y_2$
$y_1 + 2y_2 \geq 5$
$-y_1 + y_2 \geq -3$
$y_1, y_2 > 0$

$y_1, y_2 > 0$
$y_1(x_1 - x_2 \leq 1) \Rightarrow y_1 * x_1 - y_1 * x_2 < y_1$
$y_2(2x_1 - x_2 \leq 2) \Rightarrow y_2 * 2x_1 + y_2 * x_2 \leq 2y_2$
$(y_1 + 2y_2)x_1 + (-y_1 - y_2)x_2 \leq y_1 + 2y_2$

(b)

For the primal LP: $x_1 = 3$ and $x_2 = 5$



For the dual LP: $y_1 = 3$ and $y_2 = 5$