Homework 6

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251.2 .

Protein = (0.5 x Hay) + (1 x Oats) + (2 x Feed) + (6 x HighP)

Carbs = (92 x Hay) + (4 x Oats) + (0.5 x Feed) + (1 x HighP)

Roughage = (5 x Hay) + (2 x Oats) + (1 x Feed) + (2.5 x HighP)

Cost = (1.8 x Hay) + (3.5 x Oats) + (0.4 x Feed) + (1 x HighP)

Protein > 40

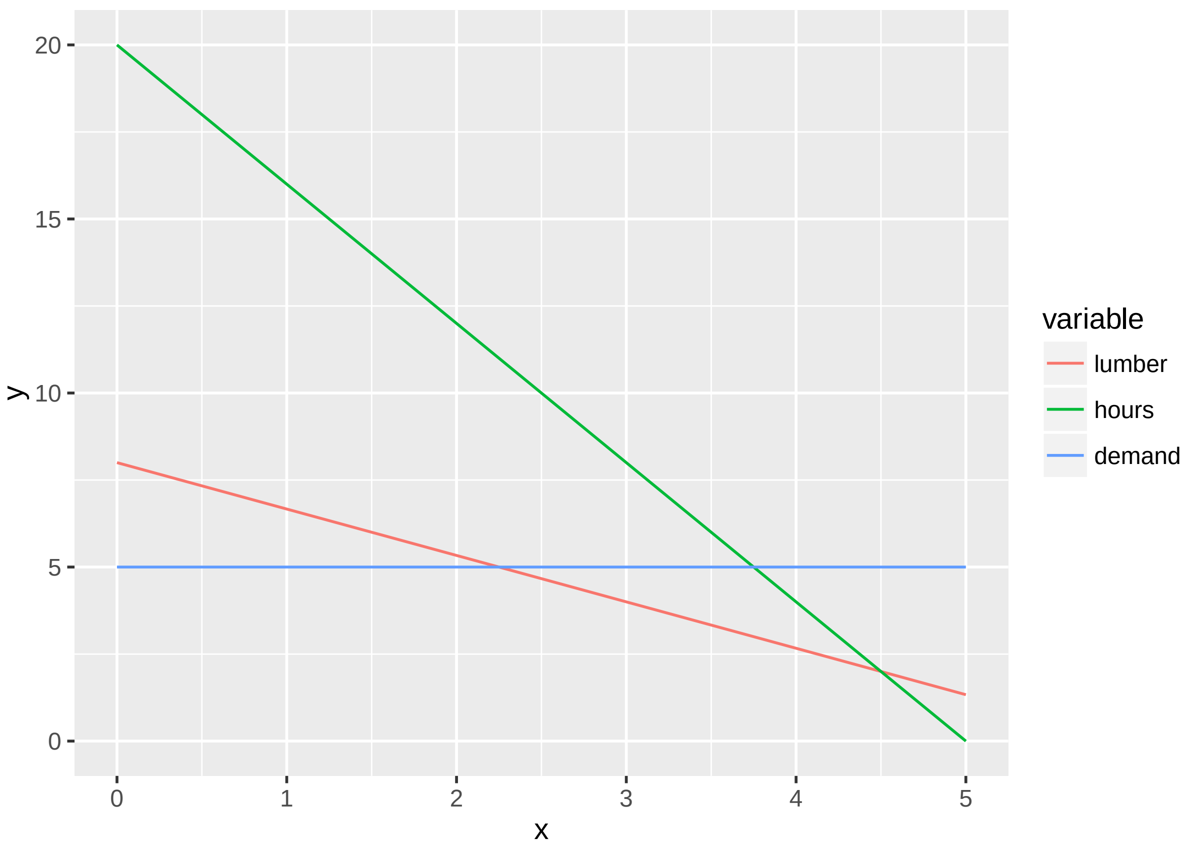
Carbs > 20

Roughage > 45

The model would optimize a diet where the constraits are met, and the price is the lowest.

264.6 Let's put them in terms of y, and graph.

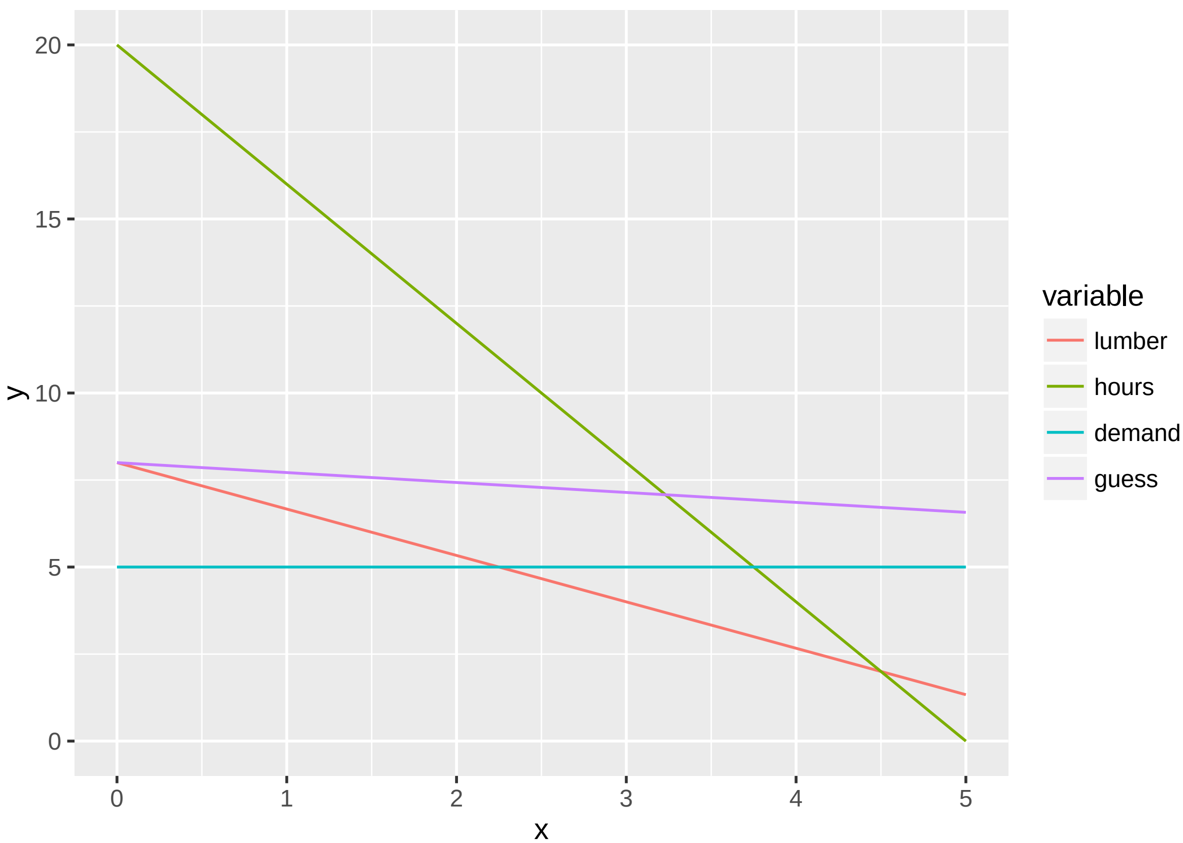
```
library(reshape2)
library(ggplot2)

x <- seq(0,5,by=0.5)
graph1 <- data.frame(x = x, lumber = (48 - (8*x)) / 6, hours = 20 - (4*x), demand = 5)
graph1 <- melt(graph1, "x", value.name="y")
ggplot(graph1, aes(x=x, y=y, color=variable)) + geom_line()
```



The triangular area formed by y=5 and 8x + 6y = 48 is the area we can focus on. From the slope of 10x + 35y, we can see that we should look at (0,8).

More graphing to check that 35*8 = 280 fits the solution

```
x <- seq(0,5,by=0.1)
graph2 <- data.frame(x = x, lumber = (48 - (8*x)) / 6, hours = 20 - (4*x), demand = 5, guess = (280 - (
graph2 <- melt(graph2, id.vars="x", value.name="y")
ggplot(graph2, aes(x=x, y=y, color=variable)) + geom_line()
```



268.6 We can use the graphs from above to sort of check our math in this section. I'll start with listing the varibles that we will eventually set to 0. We know y cannot be 0, so we are left with x, c1, c2, and c3.

$$8x + 6y + c1 \leq 48$$
$$4x + y + c2 \leq 20$$
$$y + c3 \geq 5$$

x, c1 gives the point (0, 8)

$$6y \leq 48$$
$$y + c2 \leq 20$$
$$y - c3 \geq 5$$

x, c2 gives an infeasable point.

x, c3 gives the point (0, 5)

$$6y + c1 \leq 48$$
$$y + c2 \leq 20$$
$$y \geq 5$$

c1, c2 gives an infeasable point.

c1, c3 gives the point (2.25, 5)

$$8x + 6y \leq 48$$
$$4x + y + c2 \leq 20$$
$$y \geq 5$$

c2, c3 gives an infeasable point.

The above feasable points give the potential solutions of (0, 5), (0, 8), (2.25, 5) which corresponds with 10x + 35y values of 175, 280, and 197.5. Again like in the previous section, (0, 8) gives the maximized solution.

278.6 .

p278 Q6 Simplex

Maximize $10x + 35y$ with $8x + 6y \le 48$

$4x + y \le 20$

$y \ge 5$

$x, y \ge 0$

tableu:

x	y	c_1	c_2	c_3	z	RHS	Ratio
8	6	1	0	0	0	48	8
4	1	0	1	0	0	20	20
0	-1	0	0	1	0	-5	$\boxed{5}$
-10	$\boxed{-35}$	0	0	0	1	0	

dep: c_1, c_2, c_3, z

indep: $x=0$, $y=0$

expt: $(x, y) = (0, 5)$

v of obj: $z = 175$

opt: -35 or "the entering variable is y"

feas: 5 or "the exiting variable is c_3"

Pivot:

x	y	c_1	c_2	c_3	z	RHS	Ratio
8	0	1	0	6	0	18	3
4	0	0	1	1	0	15	15
0	1	0	0	-1	0	5	-5
-10	0	0	0	$\boxed{-35}$	1	175	

dep: y, c_1, c_2, z

indep: $x=0$, $c_3=0$

~~expt:~~

opt: entering is -35 or c_3

feas: exiting is 3 or c_1

pivot:

x	y	c_1	c_2	c_3	z	RHS
4/3	0	1/6	0	1	0	3
8/3	0	-1/6	1	0	0	12
4/3	1	1/6	0	0	0	8
110/3	0	35/6	0	0	1	280

dep: y, c_2, c_3, z

indep: $x=0$, $c_1=0$

$$8x + 6y + c_1 = 48$$

$$6y = 48$$

$$y = 8$$

$$x = 0$$

solution is (0, 8) wit

RHS of $280

284.1 Based on the extreme point and slopes from the example, and the equation from the question we can get the equation below that describes the carpenter's planning:

$$20 \leq c_2 \leq 37.5$$

The gist of the equation means that the carpenter should make 12 tables and 15 bookcases until the profit margin is above or below (20, 37.5). If below, make tables, if above, make bookcases.

295.3 . I feel like I'm missing some sort of information to do this problem, I'll work on it or get an answer from someone on how they did it, and try to include with next week's set.

```
x <- c(7,14,21,28,35,42)
y <- c(8,41,133,250,280,297)
```