CUNY DATA 609 HW 6

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p251 #1

Nutritional Requirements – A rancher has determined that the minimum weekly nutri- tional requirements for an average-sized horse include 40 lb of protein, 20 lb of carbohy- drates, and 45 lb of roughage. These are obtained from the following sources in varying amounts at the prices indicated:

	Protien (lb)	Carbohydrates (lb)	Roughage (lb)	Cost
(H) Hay (per bale)	.5	2.0	5.0	$1.80
(T) Oats (Per Sack)	1.0	4.0	2.0	$3.50
(B) Feeding Blocks (block)	2.0	.5	1.0	$0.40
(P) High Protien Concentrate (sack)	6.0	1.0	2.5	1.0
Requirements/hourse/week	40.0	20	45	

Objective minimize cost: $C = 1.8H + 3.5T + .4B + 1P$

Constraints:	
Protien (lb)	$.5H + 1T + 2.0B + 6.0P \leq 40$
Carbohydrates (lb)	$\$2H + 4.0\ T + .5\ B + 1.0$
Roughage (lb)	$5.0H + 2.0T + 1.0B + 2.5 = 45 \leq 45$
limiting factor:	$H, T, B, P \geq 0$

P 264 #6

Maximize 10x + 35y subject to : $8x + 6y \leq 48$ (board feet lumber) $6y \leq 48 - 8x$ $y \leq 8 - (4/3)x$ $4x + y \leq 20$ (hours of carpentry) $y \leq 20 - 4x$ $y \geq 5$ (demand) $x, y \geq 0$ (non-negativity)

```
lumber_func <- function (x) { 8- x }
hours <- function(x) {20-(4*x) }
demand <- function (x) { 5  }
objective <- function(x,y) { 10 *x + 35 *y}



 ggplot(data.frame(x = c(0, 5)), aes(x)) +
  stat_function(fun = lumber_func, aes(colour = "lumber"), linetype="dashed") +
  stat_function(fun = hours, aes(colour = "hours"), linetype="dashed") +
 stat_function(fun = demand, aes(colour = "demand"), linetype="dashed") +
   stat_function(fun = objective, aes(colour = "objective")) +

  geom_area(aes ( y=  8- x) , fill = "green", alpha = .1) +
  geom_point( aes ( x=0 , y= 8)) +
    geom_point( aes ( x=3 , y= 5)) +
```
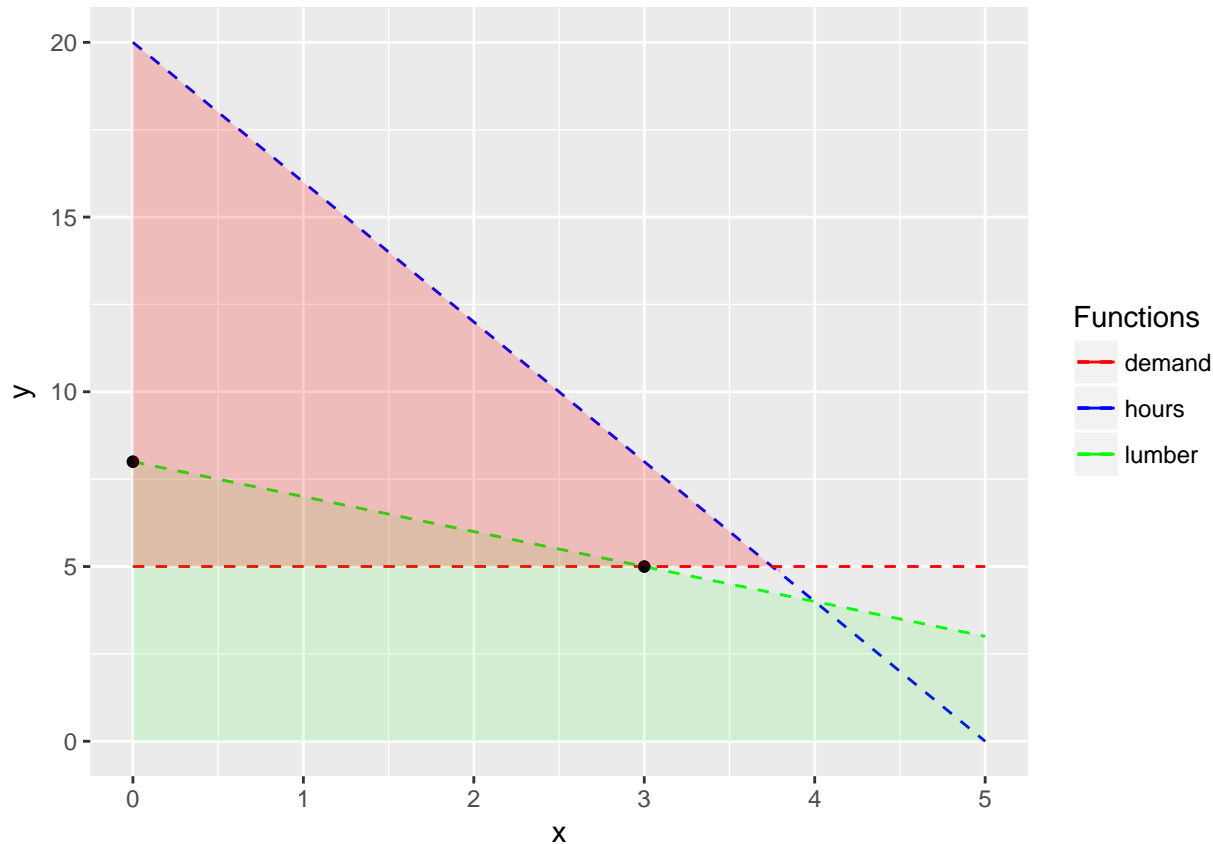
```
  geom_ribbon(data = data.frame (x=c(0,3.8)) , aes(ymin = 5 , ymax = 20-(4*x), max = 3), fill = "red",
  scale_colour_manual("Functions", values = c("red", "blue", "green", "purple"))
```

```
## Warning: The plyr::rename operation has created duplicates for the
## following name(s): (`ymax`)
```

```
## Warning: Computation failed in `stat_function()`:
## argument "y" is missing, with no default
```



```
c (objective ( 0,8), objective ( 3,5))
```

```
## [1] 280 205
```

Objective function is maximized at $(0,8) = 280$

P 284 #1

For the example problem in this section, determine the sensitivity of the optimal solution to a change in c_2 using the objective function $25x_1 + c_2x_2$.

Maximize $z = 25x_1 + 30x_2$

lumber slope $= \frac{-2}{3}$

Labor slope $= \frac{-5}{4}$

$\frac{-2}{3} \le \frac{-25}{c_2} \le \frac{-5}{4}$

$20 \le c_2 \le 37.5$