# Assignment #10 Solutions

due Friday, October 30th, 2020

**Problem 1 (25 points)** Using Excel solver, the optimal solution is  $(x_1, x_2) = (9.99, 45)$  with profit = 212.50.

1 Evergreen Fertilizer Compa					
2					
3 Variables:					
4 Colonial Paneling (x1)	9.999999				
5 Western Paneling (x2)	45				
6					
7 Profit:	212.50001				
8					
9 Constraints	x1	x2	Used	Constraint	Allowed
available potassium	3	6	300	=	300

#### Problem 2

### (a) (15 points)

Let  $x_1$  = weekly subscription price

 $x_2$  = weekly advertisement price

 $q_1$  = weekly subscriptions

 $q_2$  = number of advertising pages sell per week

Note that

$$q_2 = 350 - \frac{50}{100}(x_2 - 250)$$

$$= 475 - 0.5x_2$$

$$q_1 = 80000 - \frac{5000}{0.1}(x_1 - 1.5) + \frac{1000}{50}(q_2 - 350)$$

$$= 148000 - 50000x_1 + 20q_2$$

$$= 157500 - 10x_2 - 50000x_1$$

Then the weekly profit  $x_1q_1 + x_2q_2$  can be written as t

$$x_1(157500 - 10x_2 - 50000x_1) + x_2(475 - 0.5x_2) = -50000x_1^2 + 157500x_1 - 10x_1x_2 + 475x_2 - 0.5x_2^2$$

Then the model is the following

$$max - 10000x_1^2 - 4000x_1 + 100x_1x_2 + 475x_2 - 0.5x_2^2$$
  
s.t.  $x_i \ge 0$ , for  $i = 1, 2$ 

Using Excel solver, the optimal solution is  $(x_1, x_2) = (1.53, 459.71)$  with profit = 229592.09.

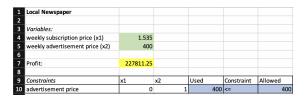
1 Local Newspaper					
2					
3 Variables:					
weekly subscription price (x1)	1.529027764				
weekly advertisement price (x2)	459.7097041				
6					
7 Profit:	229592.0921				
8					
9 Constraints	x1	x2	Used	Constraint	Allowed
10					

# (b) (10 points)

Let  $x_1$  = weekly subscription price  $x_2$  = weekly advertisement price The model is the following,

$$max - 10000x_1^2 - 4000x_1 + 100x_1x_2 + 475x_2 - 0.5x_2^2$$
  
 $s.t.$   $x_2 \le 400$   
 $x_i \ge 0$ , for  $i = 1, 2$ 

Using Excel solver, the optimal solution is  $(x_1, x_2) = (1.535, 400)$  with profit = 227811.25.



# Problem 3 (25 points)

1	Problem 3		
2	Data	Bin	Frequency
3	137	136	0
4	139	138	3
5	141	140	2
6	137	142	4
7	144	144	4
8	141	146	0
9	139		
10	137		
11	144		
12	141		
13	143		
14	143		
15	141		

**Problem 4 (25 points)** The histogram may or may not look similar. It is not a viable method for telling whether different articles were written by different authors.