HW-1 QUESTIONS

Q1: Jack wants to apportion his time of about 10 hours a day between work and play. He estimates that play is twice as much fun as work. He also wants to study at least as much as he plays. However, if he is going to get all his homeworks done, he cannot play more than 4 hours a day. How should he allocate his time to maximize his pleasure from both work and play?

Dec. variables:

x_1 = play hours per day

x_2 = work hours per day

Constraints:

$x_1 + x_2 \leq 10$ (10,10)

$x_1 - x_2 \leq 0$ (0,0)

$x_1 \leq 4$ ($x_1 = 4$)

$x_1, x_2 \geq 0$

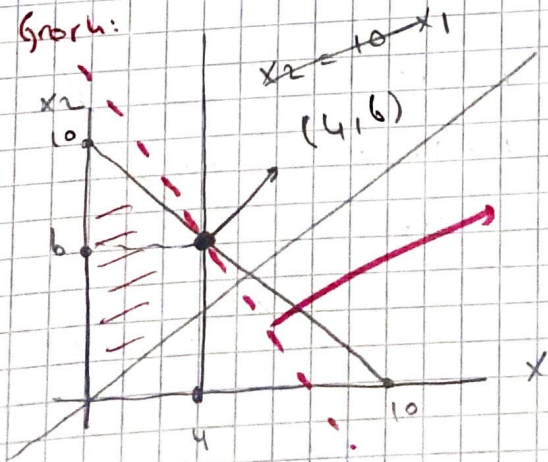
$z = 2x_1 + x_2$

$2x_1 + x_2 = 0$ (0,0)

$2x_1 + x_2 = 2$ (1, 2)

$2x_1 + x_2 = 10$ (5, 10)

Graph:



$z = 2x_1 + x_2$, $z = 2.(4) + 6$

$z = 8 + 6 = 14$

$x_1 = 4$

$x_2 = 6$

$z = 14$

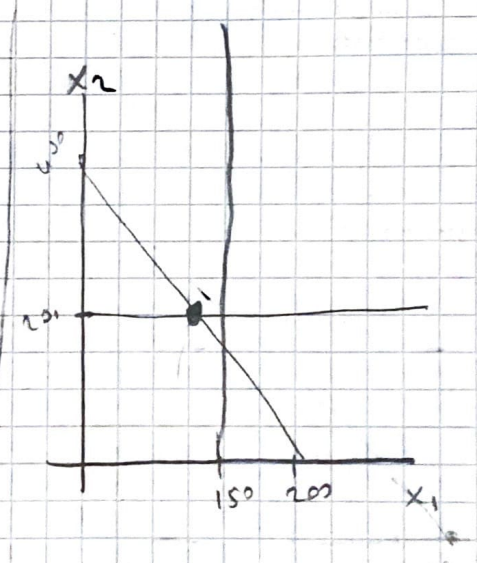
Q2: Wild West produces two types of cowboy hats. A type 1 hat requires twice as much labor time as type 2. If the all available labor time is allocated to Type 2, the company can produce 400 Type 2 hats in a day. Market limits for Type 1 is 150 while Type 2 is 200. The profit is $8 per Type 1 and $5 per Type 2. Determine the # of hats of each type that would maximize profit?

Soln:

~~Constraints~~: Decision Variables:

x_1 : Daily produced Type 1

x_2 : " produced Type 2

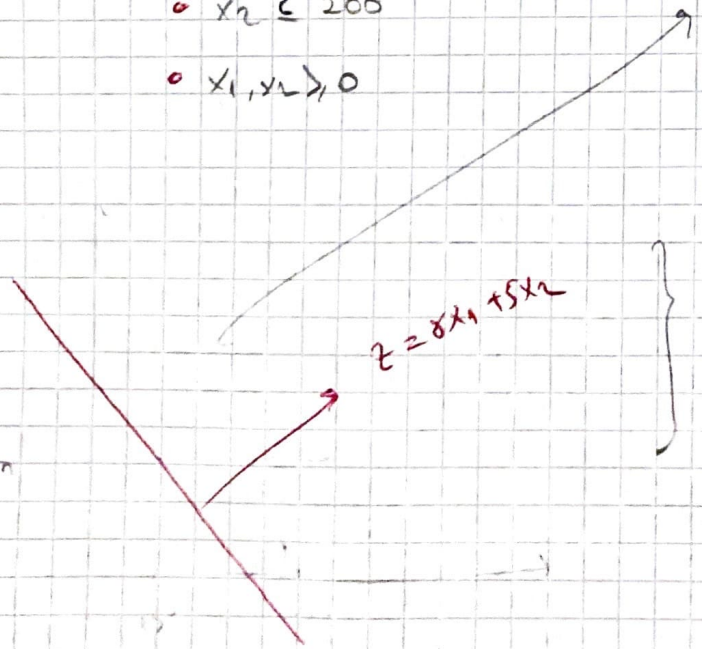


Constraints:

$z = 8x_1 + 5x_2$

* Available labour time = ~~2 hrs~~ = 400

- $2x_1 + x_2 \leq 400$ (200, 400)
- $x_1 \leq 150$
- $x_2 \leq 200$
- $x_1, x_2 \geq 0$



Q3: John must work at least 20 work hours. Store 1, he can work 5 hours to 12 hours in a week. Store 2, he can work 6 hours to 10 hours. In store 1, stress is 8 while in store 2, stress is 6. How many hours should John work in each store?

Decision variables

x_1 = # of hours in store 1

x_2 = # of hours in store 2

Constraints

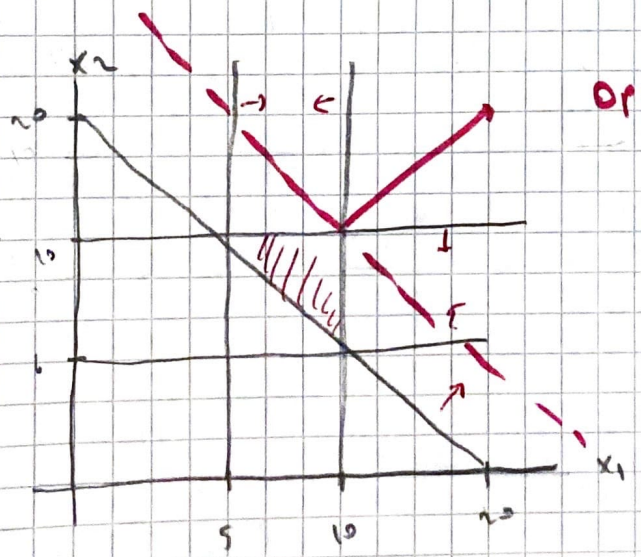
$z = 8x_1 + 6x_2$

$x_1 + x_2 \geq 20$

$5 \leq x_1 \leq 12$

$6 \leq x_2 \leq 10$

Graph:



Optimum: $x_1 = 10$

$x_2 = 10$

$z = 140$

Q5: Day Trader wants to invest a sum of money that would generate an annual yield of at least $10.000. Two groups are available. Blue chips and High Tech. Blue chips gives 10% and High tech gives 25%. Trader wants to limit amount invested in these stocks to no more than 60% of the total investment. What is the minimum amount of Trader should invest in each stock group to accomplish the investment goal?

Decision Variables:

x_1 = investment in blue chip (10^3 $)

x_2 = investment in high tech (10^3 $)

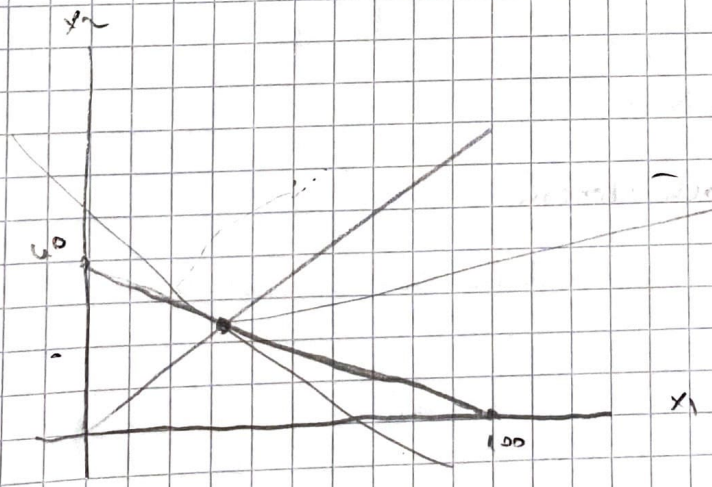
Constraints:

$0,1x_1 + 0,25x_2 \geq 10$ (100, 40) $A = x_1 + x_2$

$x_1 \geq 0,6(x_1 + x_2)$ → $0,6x_1 - 0,4x_2 \geq 0$ → (0,0)

$x_1, x_2 \geq 0$

Graphical Solution:



$0,15x_1 = 10 - 0,1x_1$

$0,6x_1 = 0,6x_1$

$1.5x_1 =$