



## IE407 - Homework 1

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October 21, 2022

### Question 1

a) As can be seen in Figure 1, optimal solution to this problem is on the point  $(200, 50)$ , where the line for wood constraint and the cotton constraint intersect. At this point, profit is 3200\$.

b) If the profit for a sweatshirt is increased by 1 and changed to 17\$, the profit function becomes  $12x + 17y$ . As can be seen in Figure 2, the optimal solution for this problem does not change.

c) When the profit for a t-shirt is changed to 20\$, the profit function becomes  $20x + 16y$ . This function has the same slope with the cotton constraint. The optimal solution is all the points on the profit line, which satisfies the wool constraint.

If the profit is increased even more, the wool constraint stops being a binding constraint, and the optimal solution changes to  $(240, 0)$ .

In either case, the optimal solution is on the line  $20x + 16y = 4800$ .

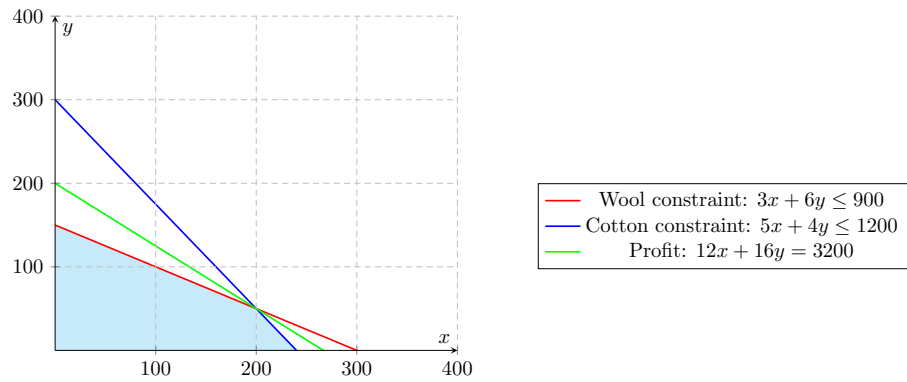


Figure 1: Graphical Solution for Question 1a

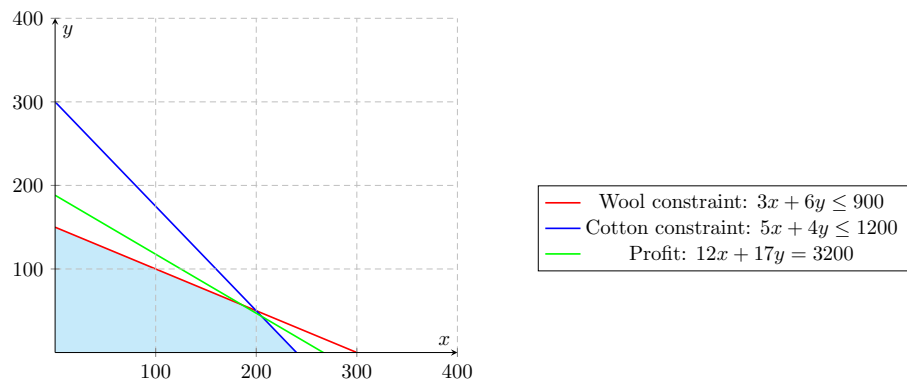


Figure 2: Graphical Solution for Question 1b

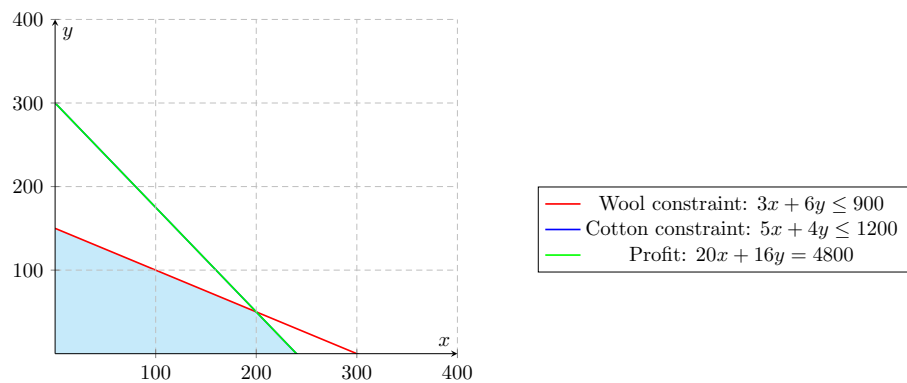


Figure 3: Graphical Solution for Question 1c

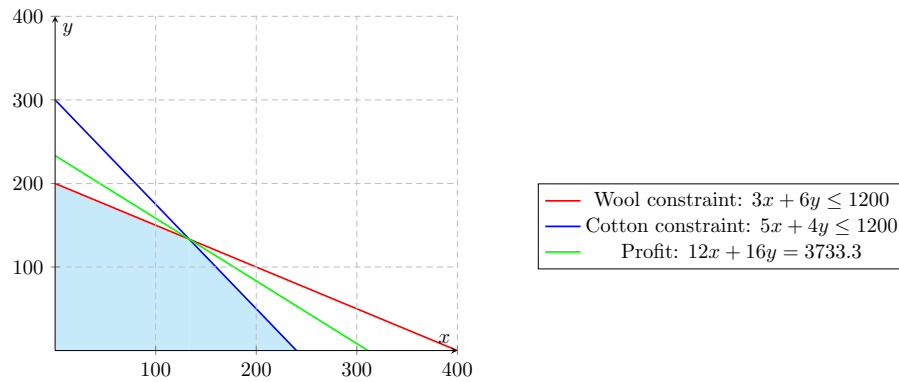


Figure 4: Graphical Solution for Question 1d

d) If 300 additional pounds of wool can be obtained, the wool constraint becomes  $3x + 6y \leq 1200$ . As can be seen in Figure 4, the optimal solution is on the point  $(133.33, 133.33)$ . On this point, the profit is  $12(133.33) + 16(133.33) = 3733.3$ .

## Question 2