3.2 Exercise(Pre-sensitivity Analysis)

Since Chateau ETH has a long relation with their neighbor Chateau EPFL, they have decided to sell Gamay grape to Ch. EPFL who has a very little grape harvest this year. The selling price is fixed to theoretically sound 1/3 (K sf/ton), but Ch. ETH wants to maintain the same total profit. Can they sell any amount of Gamay with this price?

Change the amount of Gamay sold to EPFL gradually, solve the resulting LP's with an LP code and graph in Firgure 3.1 the total profit (sum of wine production profit and grape selling profit) to check the critical point(s).

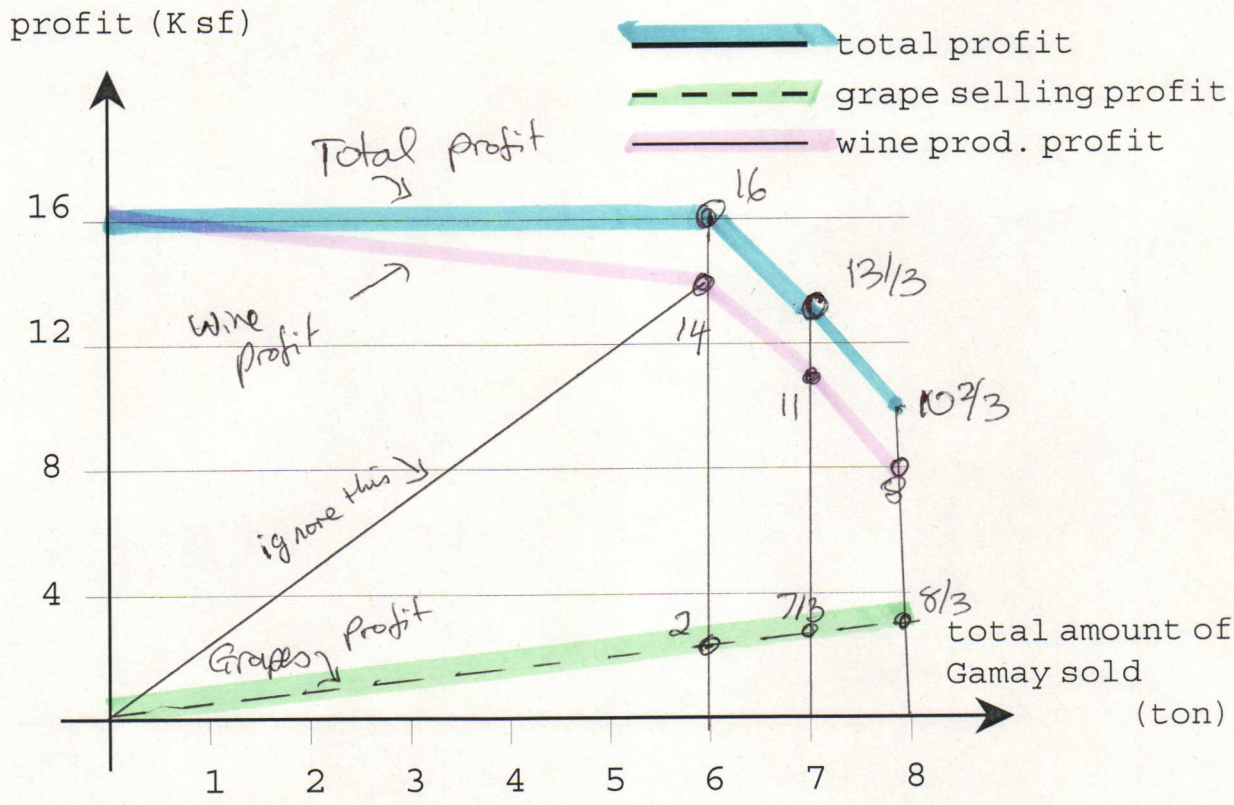

Figure 3.1: Profit Analysis on Gamay Selling with the Fixed Price 1/3

Run LP-SOLVE with $b_2 = 8, 7, 6, 5, 4, 3, 2, 1, 0$ to get these numbers.

See next sheet to see why things change when we sell 6 ktons to EPFL.

3.2

z^t - max $3x_1 + 4x_2 + 2x_3$ — Duals

$2x_1 \leq 4$ — y_1

$x_1 + 2x_3 \leq 8$ — y_2

$3x_2 + x_3 \leq 6$ — y_3

$x_1, x_2, x_3 \geq 0$

Opt soltn: $x_1^* = 2$, $x_2^* = 1$, $x_3^* = 3$, $z^* = 16$

$y_1^* = 4/3$, $y_2^* = 1/3$, $y_3^* = 4/3$

$y_2^* = \frac{1}{3}$ is "price" of gamay so selling at this price for a while will not change total profit of $z^* = 16$ (See chart). To see why it changes when 6 k tons are sold compute the optimum dictionary (I used Maple!)

$$x_1 = 2 - \frac{x_4}{2}$$

$$x_2 = 1 - \frac{x_4}{12} + \frac{x_5}{6} - \frac{x_6}{3}$$

$$x_3 = 3 + \frac{x_4}{4} - \frac{x_5}{2}$$

$$z = 16 - \frac{4x_4}{3} - \frac{x_5}{3} - \frac{4x_6}{3}$$

$x_5 = 0$ is the slack of Gamay. As we increase from zero it gives the amount we can sell to EPFL. If we don't pivot this price is $y_2^* = 1/3$ to break even. Now pivot on x_5 and apply the ratio test. when $x_5 = 6$ ~~both~~ $x_3 = 0$ and after we pivot the dual prices change.