Introduction to Market Structures
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Lecture 37
Tutorial on Stackelberg Price Competition

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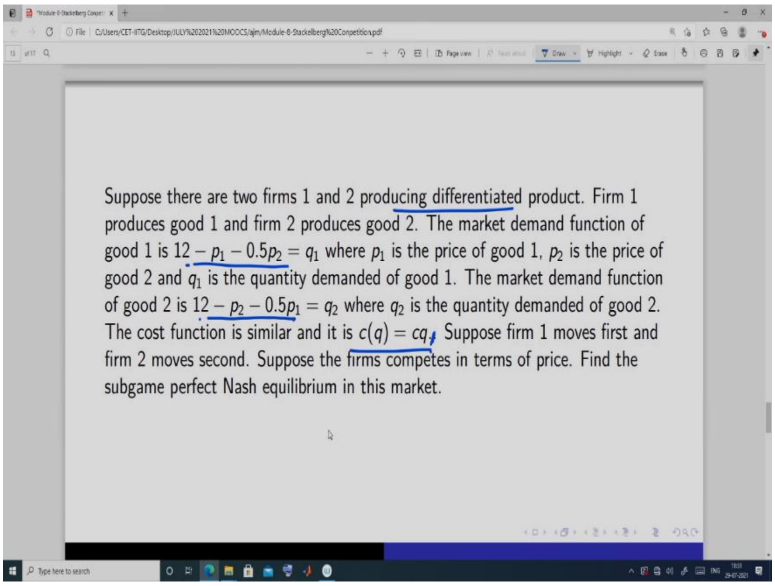

Suppose the firm 1 and firm 2 produces differentiated good and the demand function of good 1 is this- $12 - p_1 - 0.5p_2 = q_1$ which is produced by firm 1, demand function of good 2 is this-$12 - p_2 - 0.5p_1 = q_2$ which is produced by firm 2 and the cost functions are same. It is like this- $c(q) = cq$ suppose firm 1moves first and firm 2 move second and find the subgame perfect Nash.

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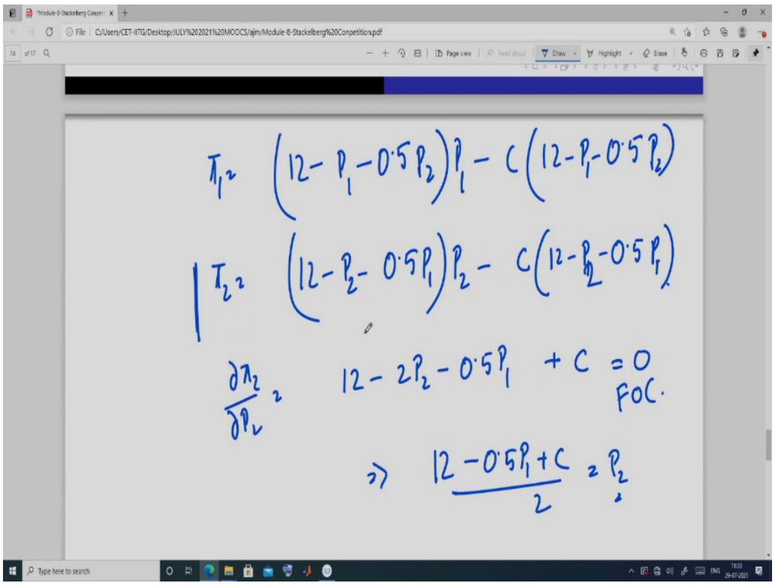

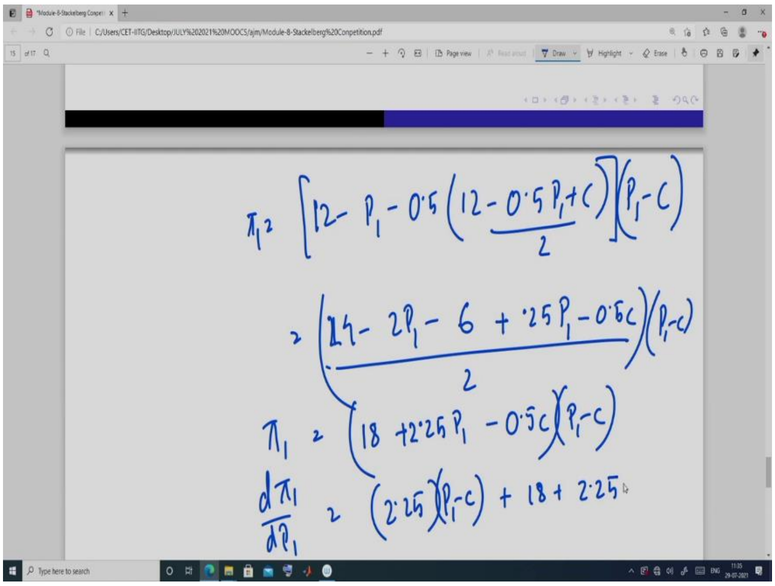

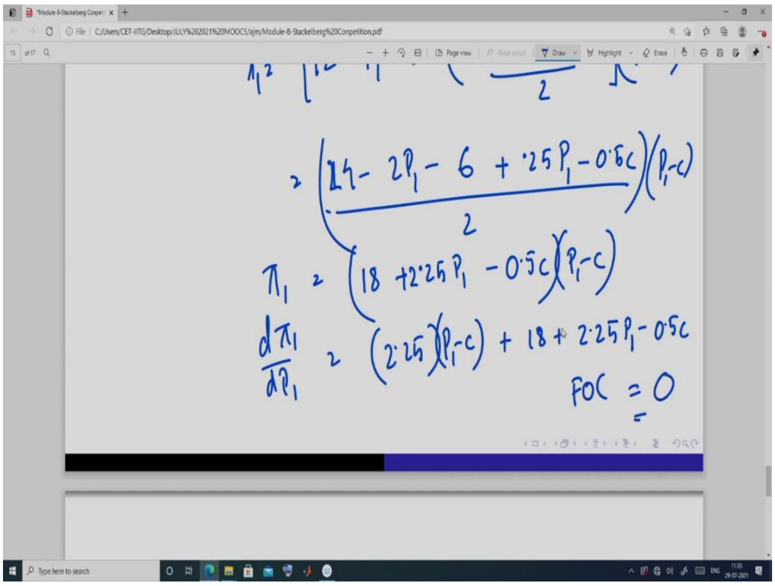

So, this is a standard problem and you can solve this. Profit of firm 1 is 12 P1, this is 0.5 P2, P1 C **is** this-$\pi_1 = (12 - P_1 - 0.5P_2)P_1 - C(12 - P_1 - 0.5P_2\ )$ and profit of firm 2, so, there it is a negative sign. So, it means the products are if the price increases, then demand goes down or if P2 increases demand for good 1 goes down. So, it means goods are complimentary in nature, is this- $\pi_2 = (12 - P_2 - 0.5P_1)P_2 - C(12 - P_2 - 0.5P_1\ )$. So, we will use backward index and first solve this, respect to P2 and we will get equal to zero first order condition.

So, the reaction function of firm 2 is it is this- $\frac{12-0.5P_1+C}{2} = P_2$. Now, you plug in this in the profit function of firm 1, take this. So, this is like 24 minus 2P1it is 6, it is this- $\pi_1 = (18 + 2.25P_1 - 0.5c)(P_1 - c)$ and you will differentiate this with respect to P1, you will get what. So, if you take the derivative of this part first, we will get this and first order condition will give that this is equal to zero- $(2.25)(P_1 - c) + 18 + 2.25P_1 - 0.5c = 0$.

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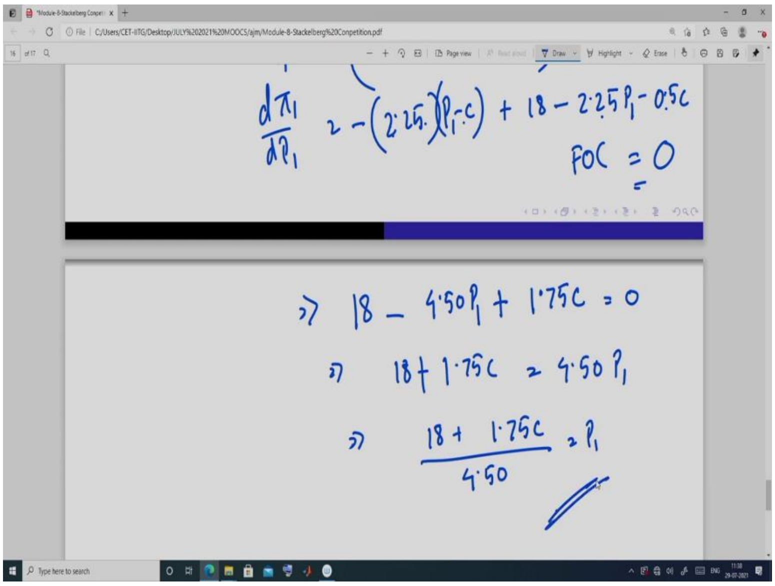

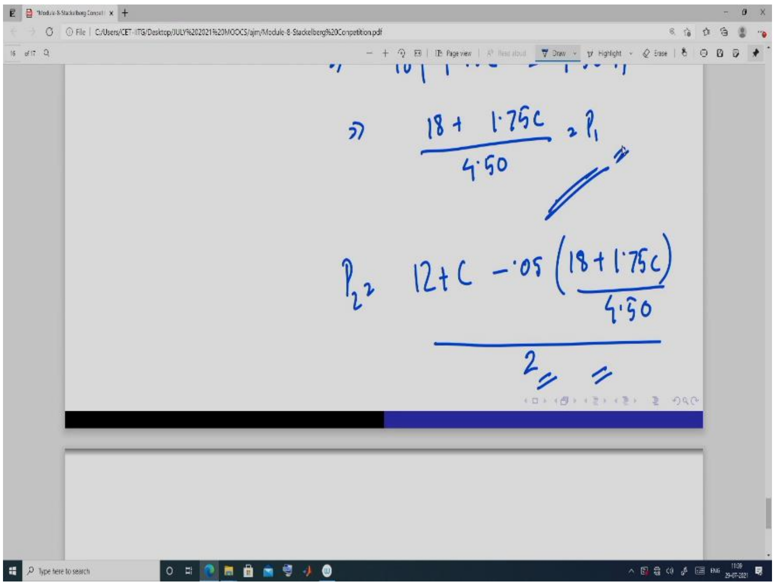

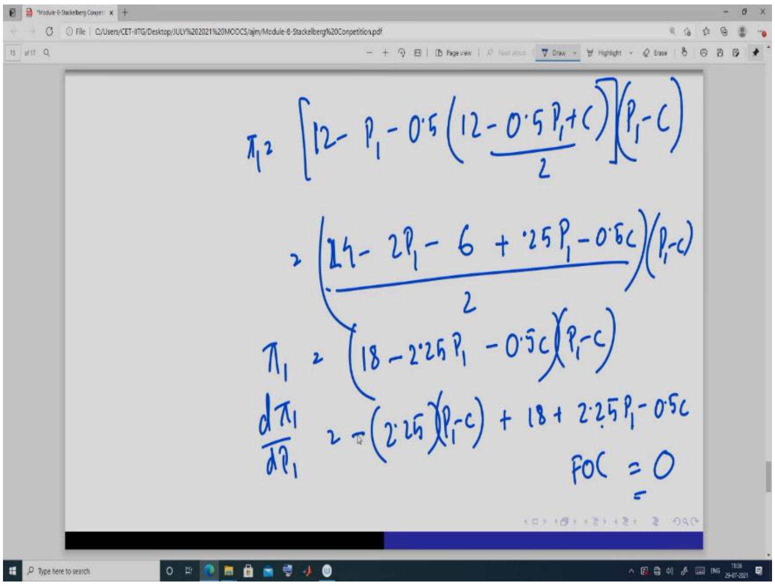

So, we get this part is equal to 18 plus it is to 4.5 P1. Cost is 2.75 to be negative. So, it will be negative and positive. So, this term is actually negative, okay. So, this is equal to zero. So, 18 minus I think there is some problem here. This term is going to be plus and this is, so it is plus 2.7. So, it will be this part is 2.5 plus 2.25 and there is minus 0.5.

So, it will be 1.75 C with this and this will be so, this is the price and you plug in this price in this reaction function and you will get P2 is equal to 12 plus C minus 0.5 this, 18 plus 1.75 C- $P_2 = \frac{12+c-0.05\left(\frac{18+1.75c}{4.50}\right)}{2}$ okay. So, we get this in the stage 2 and this in the stage 1. So, these are the subgame perfect Nash equilibrium prices in this price competition, okay.