KANDIDAT

10016

PRØVE

SØK1011 1 Markeder og markedssvikt

Emnekode	SØK1011
Vurderingsform	Skriftlig eksamen
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Section 1

Oppgave	Tittel	Oppgavetype
i	SØK1011V23	Informasjon eller ressurser
1	SØK1011	Langsvar

1 SØK1011

Skriv ditt svar her

Ord: 0

Knytte håndtegninger til denne oppgaven?
Bruk følgende kode:

0 4 8 2 3 9 3

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Writing area Skriveområde

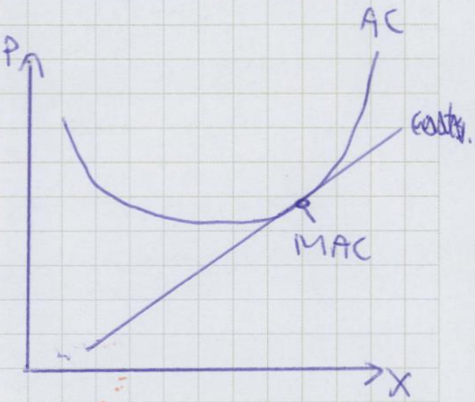
1) a) $X = 80 - 5P$

$5P = 80 - X$

$P = 16 - \frac{1}{5}X \Rightarrow$ Marked demand

In a perfectly competitive marked, firms will produce at minimum average cost (MAC).

Units produced	costs	Average costs
1	10	10
2	18	9
3	24	8
4	28	7
5	30	6
6	42	7
7	56	8
8	72	9
9	90	10
10	110	11



In the Long run equilibrium, P = MAC

P = 6 in the long run equilibrium

b) Plugging in the demand function:

$6 = 16 - \frac{1}{5}X$

$\frac{1}{5}X = 16 - 6 \Rightarrow \frac{1}{5}X = 10$

$X = 10 \cdot 5$

X = 50 in the long run equilibrium

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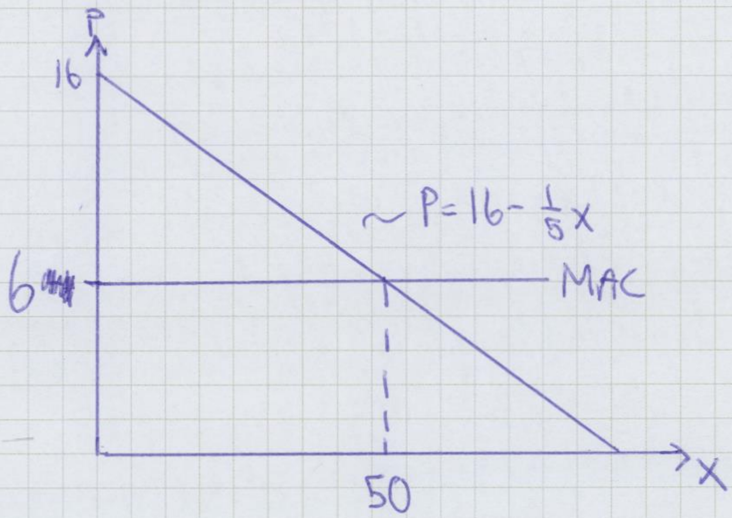
c) Finding the number of firms in the long run equilibrium:

$X = 50$, when each firm produces 5 units

$\frac{50}{5} = 10$ firms

Graphically:



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Task 2)

Monopoly marked
Marginal costs = 0
P = 0

} 2nd degree price discrimination

a) Type 1: $P = 20 - 4x$

Type 2: $P = 20 - 2x$

consumer surplus type1

$/// = CS_1(x=5)$

Type 1: →

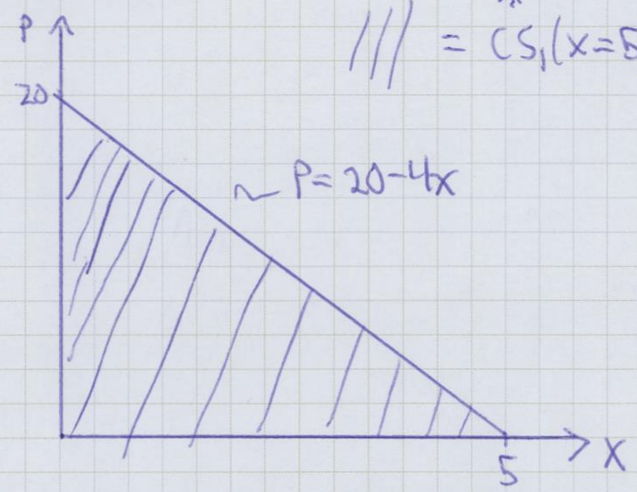
$P = 0$

$0 = 20 - 4x$

$\frac{4x}{4} = \frac{20}{4}$

$x = 5$

$x_1 = 5$



The firm will maximize profits and set

$F_1 = CS_1(x=5)$

$CS_1(x=5) = \frac{(P_{max} - P) \cdot x_1}{2} = \frac{(20-0) \cdot 5}{2} = 50$

$F_1 = 50$

For type 1: $(x_1, F_1) = 5, 50$

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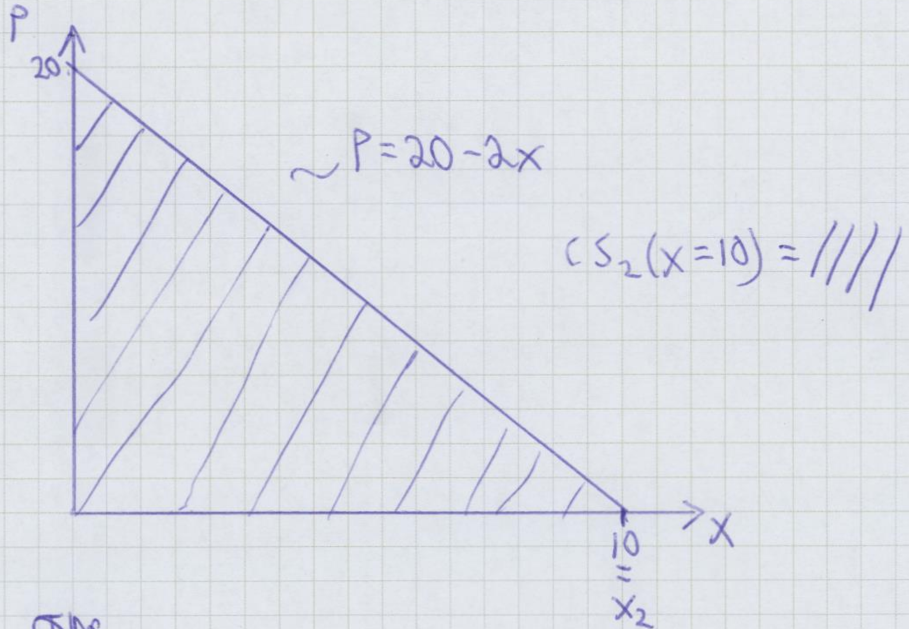
Type 2:

$P = 20 - 2x$

$P = 0$

$0 = 20 - 2x$

$\frac{2x}{2} = \frac{20}{2} \Rightarrow x_2 = 10$



The firm will maximize profits and set $F_2 = x_2$

$CS_2(x=10) = \frac{(P_{max} - P) \cdot x_2}{2}$

$CS_2(x=10) = \frac{(20-0) \cdot 10}{2} = 100$

$F_2 = 100$

For type 2: $F_2 = 100$, $x_2 = 10$

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Task 2b

When consumers get to choose their own package, they will seek for the package giving them the highest consumer surplus as possible

In task a), the fee (F) was set equal the the entire CS in both packages. Now, we will see what the consumers choose to do if they can choose by themselves.

Type 1: Buying package 2: ?

$P = 20 - 4 \cdot 10 = -20$, No. Their willingness to pay is not high enough.

Buying pack 1:

Net CS: $CS_1(x=5) - F_1 = 50 - 50 = \underline{\underline{0}}$

$0 > -20 \Rightarrow$ Type 1 will stick with package 1

Type 2: Has two options:

Buy the package designed for them:

Net $CS_2(x=10) - F_2 = 100 - 100 = \underline{0}$

Or buy the package 1 ?

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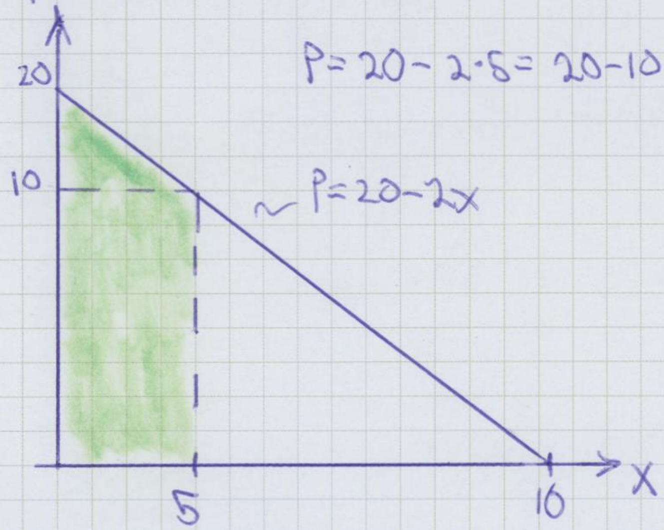
Type 2 buying pack one $(x=5)$

$P = 20 - 2\cdot 5 = 20 - 10 = \underline{10}$



$CS_2(x=5) = \frac{(20-10)\cdot 5}{2} + 10\cdot 5$

$CS_2(x=5) = \frac{10\cdot 5}{2} + 50 = \underline{75}$

Net $CS_2(x=5) = 75 - F_1 = 75 - 50 = \underline{\underline{25}}$

Type 2, consumers will recieve a net CS of 25 ~~w~~ buying package 1 $(x=5)$

$\left.\begin{array}{l} CS_2(x=10) = 0 \\ CS_2(x=5) = 25 \end{array}\right\} 25 > 0,$

If the consumers get to choose the package, all the consumers will sign up for package 1 and package 2 will not be sold in the market

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The two packages are so-called not incentive compitable

In order to make the type 2 consumers sign up for plan 2, the firm will have to lower their F_2.

$$CS_2(x=5) - F_1 \leq CS_2(x=10) - F_2$$

⇓

Incentive compatability constraint

$$F_2 \geq CS_2(x=10) - CS_2(x=5) + F_1$$

~~$F_2 \geq 100 - 50$~~

$$F_2 \leq 100 - 75 + 50$$

~~$F_2 \geq 75$~~ $F_2 \leq 75$

If F_2 gets lowered to 75:

Net CS_2 by buying package #2:

$CS_2(x=10) - F_2 \Rightarrow 100 - 75 = 25$

The two packages are now incentive compatible.

$X_1 = 5$, $F_1 = 50$

$X_2 = 10$, $F_2 = 75$

Håndtegning 8 av 23

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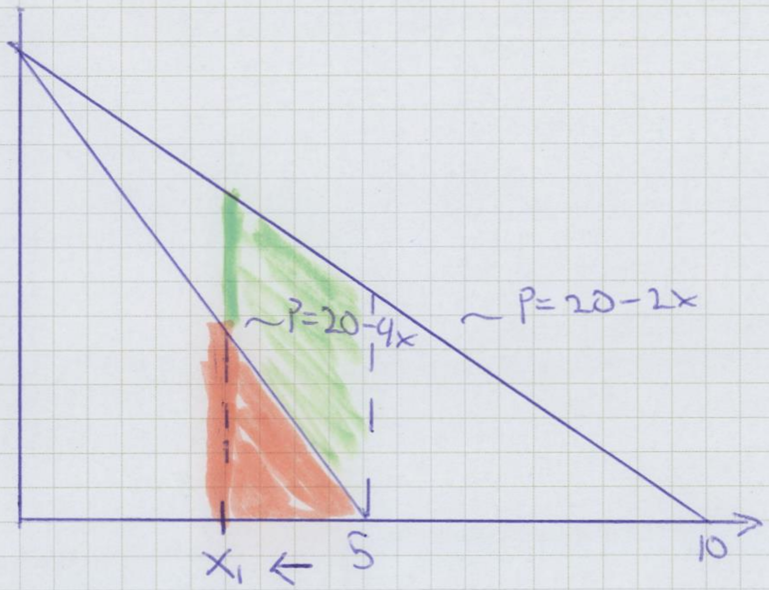
To increase profits even more, the firm can do one more thing.

~~Increase X~~

Reduce x_1 ⇒ Make x_1 less attractive for type 2, and then increase F_2.



(red) = Reduction in F_1

(green) = Increase in F_2

(green) > (red) ⇒ Higher profits, and the 2 packages are still incentive compatible.

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Task 3

$P = 30 - 2X$ $\quad X = x_A + x_B$

Cournot competition, with equal marginal costs.

a) $P = 30 - 2(x_A + x_B)$

$P = 30 - 2x_A - 2x_B$

Total revenue of firm A:

$R_A = (30 - 2x_A - 2x_B)\, x_A =$

$R_A = 30x_A - 2x_A^2 - 2x_B x_A =$

$R_A = 30x_A - 2x_A^2 - 2x_B x_A = 0$

Finding the marginal revenue of x_A

$R_A' = 30 - 4x_A - 2x_B = 0$

Setting marginal revenue = marginal cost

$30 - 4x_A - 2x_B = 4$

$\Rightarrow 4x_A = 26 - 2x_B$

$x_A = \frac{13}{2} - \frac{1}{2}x_B \Rightarrow x_A$'s best response function

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Finding x_B's best response = (Expecting the same as for x_A) due to equal c ~~demand~~

$P = 30 - 2x_A - 2x_B$

$R_B = (30 - 2x_A - 2x_B)x_B$

~~[illegible]~~

$R_B = 30x_B - 2x_A x_B - 2x_B^2$

$R_B' = 30 - 2x_A - 4x_B$

$MR = c$

$30 - 2x_A - 4x_B = 4$

$4x_B = 26 - 2x_A$

$x_B = \frac{13}{2} - \frac{1}{2}x_A \Rightarrow$ B's best response function

$x_A = 6,5 - \frac{1}{2}x_B$

$x_B = 6,5 - \frac{1}{2}x_A$

Solving for x_A

$x_A = 6,5 - \frac{1}{2}\left(6,5 - \frac{1}{2}x_A\right)$

$x_A = 6,5 - 3,25 + \frac{1}{4}x_A$

$\frac{3}{4}x_A = 6,5 - 3,25$

$\frac{3}{4}x_A = 3,25$

$x_A = 3,25 \cdot \frac{4}{3} \Rightarrow \underline{\underline{4,33}}$

Solving for x_B:

$x_B = 6,5 - \frac{1}{2} \cdot 4,33$

$\underline{\underline{x_B = 4,33}}$

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In equilibrium, each firm will produce 4,33 units

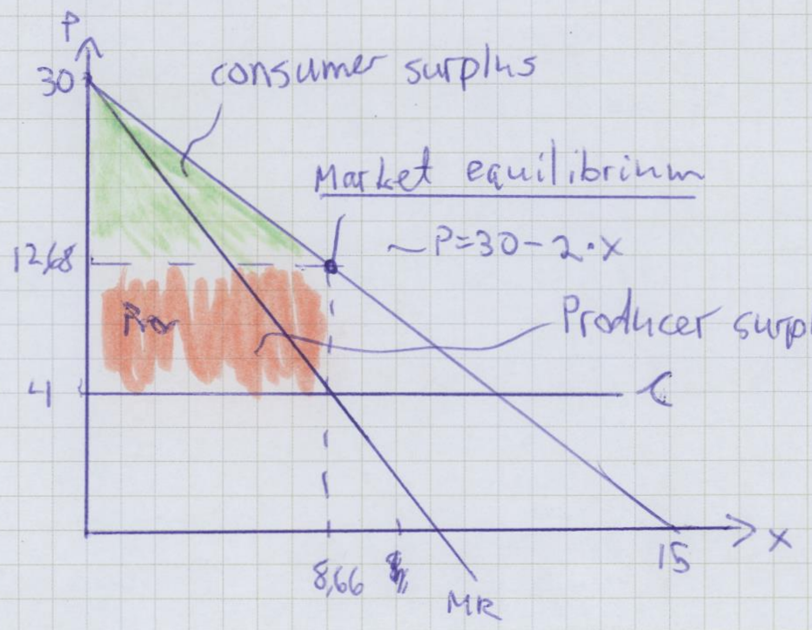
Task 3b) $x_A + x_B = X$

$4,33 + 4,33 = 8,66$

Finding the price

$P = 30 - 2 \cdot 8,66$

$P = 12,68$



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Task 4

H = High price

L = Low price

2 firms, 1 and 2

a) Possible outcomes:

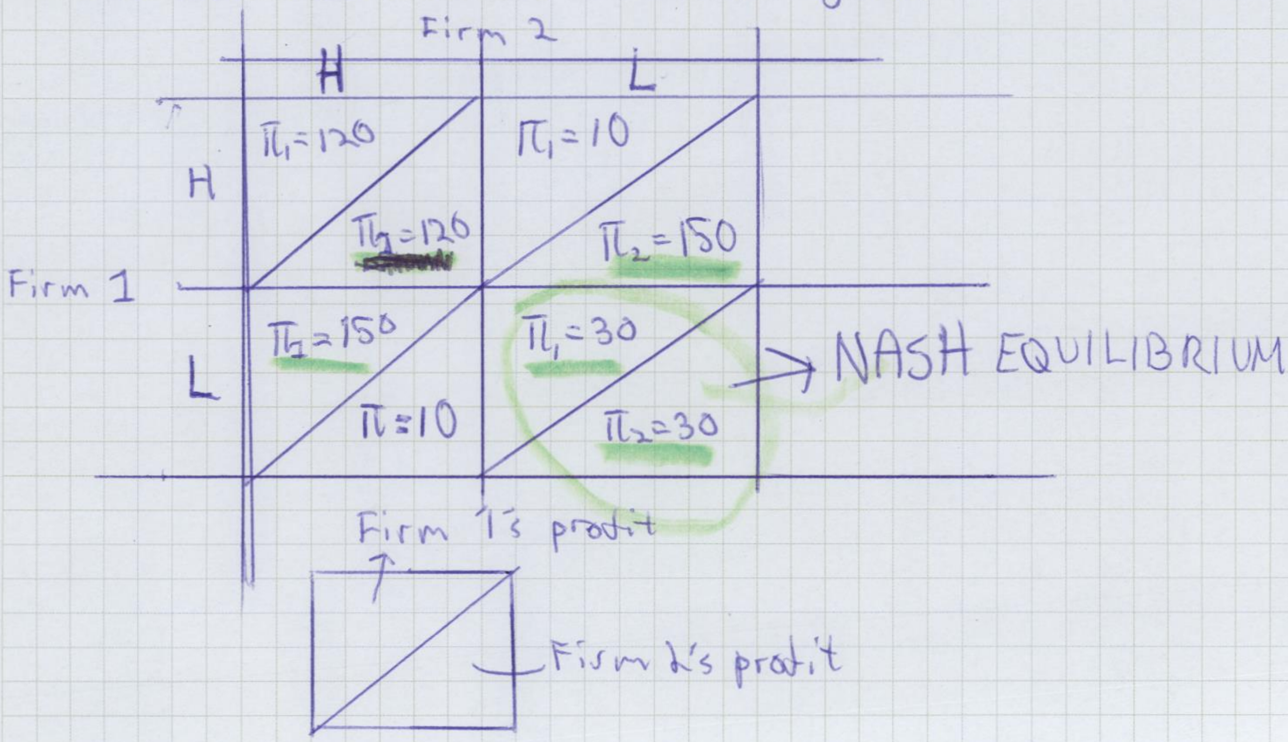
1) Firm 1 chooses H, firm 2 chooses H: $\pi_1 = 120$ $\pi_2 = 120$

2) Firm 1 chooses L, firm 2 chooses L: $\pi_1 = 30$ $\pi_2 = 30$

3) Firm 1 chooses H, firm 2 chooses L: $\pi_1 = 10$ $\pi_2 = 150$

4) Firm 1 chooses L, firm 2 chooses H: $\pi_1 = 150$ $\pi_2 = 10$

We can draw this as a one-time game:



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Interpretations from the game:

- If firm 1 choose H, firm 2 will choose ~~two~~ to set a low price. ($\Pi_2 = 150 > \Pi_2 = 120$)
- If firm 1 choose L, firm 2 will set a low price. ($\Pi_2 = 30 > \Pi_2 = 10$)
- If firm 2 choose H, firm 1 will set price low ($\Pi_1 = 150 > \Pi_1 = 120$)
- If firm 2 choose L, firm 1 will set a low price ($\Pi_1 = 30 > \Pi_1 = 10$)

Our Nash equilibrium in this game is when both players choose the same strategy.

The Nash equilibrium is when both players choose to set a low price.

~~As the Nash equilibrium both players choose to~~

In the Nash equilibrium, each firm gets a profit of 30

Another thought on why the Nash equilibrium is 30: is that both players show a dominant strategy throughout ~~thee~~ entire game. ⇒ ~~No~~ Each player will choose to set a low price, regardless of the strategy of the other player

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A Nash equilibrium is a situation, where no ~~each~~ player can get better of by changing its strategy, given the strategy of the other players.

Task 3b Infinite game.

If the firms choose to collude ~~through~~ by setting prices H, each firm will make a higher profit than in the Nash equilibrium. (120 > 30)

The challenge by choosing to collude is the reward each firm can get by "cheating" and set it's price low, while the other player sets it price high.

By cheating, a firm will rather set its price low, when the other is producing at high ($\pi_i = 150 > \pi = 120$)

~~In a possible infinit~~

In a possible infinite game by colluding for each firm

π^D = Duopoly (colluding)

π^C = One firm cheats for 1 period

π^L = Nash equilibrium outcome, ~~after~~ forever after period 1 if one firm cheats, π^L = Low price

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$\pi^D = 120$

$\pi^C = 150$

$\pi^L = 30$

~~collusion is~~

By colluding forever:

$$\pi^D + \pi^D \cdot \delta + \pi \cdot \delta^2 + \pi \cdot \delta^3 \ldots\ldots$$

$$\Rightarrow \pi^D \cdot \frac{1}{1-\delta}$$

If one firm cheats: in period 1, period 2 → ∞ will be π^L

$$\pi^C + \pi^L \cdot \delta + \pi^L \cdot \delta^2 + \pi^L \cdot \delta^3 + \ldots$$

$$\Rightarrow \pi^C + \pi \cdot \frac{\delta}{1-\delta}$$

~~Collusion is~~

Collusion is likely to happen if:

$$(1-\delta) \cdot \left(\pi^D \cdot \frac{1}{1-\delta}\right) > \pi^C + \pi^L \cdot \frac{\delta}{1-\delta}$$

$$\pi^D > \pi^C(1-\delta) + \pi^L \cdot \frac{\delta}{\cancel{1-\delta}} \cancel{(1-\delta)}$$

$$\pi^D > \pi^C - \pi^C \delta + \pi^L \delta$$

$$\pi^C \delta - \pi^L \delta > \pi^C - \pi^D \Rightarrow \delta > \frac{\pi^C - \pi^D}{\pi^C - \pi^L} \Rightarrow \frac{150-120}{150-30}$$

$$\Rightarrow \underline{\delta > 0{,}25}$$

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$\delta > 0{,}25$,

$0{,}25 < 0{,}4 \Rightarrow$ Yes ~~which~~

By colluding each firm are better off by colluding forever when $\delta = 0{,}4$, and the probability of colluding is likely to happen under the condition that the firms "talk to each other." Since their dominant strategy in the game was to set a low price

This is something we call tacit collusion. Firms don't have to explicitly talk, ~~~~ ~~But in the case of dominant strategies i find it important that the firms talk~~. But signal to collude

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Task 5

$P = 130 - 25x \Rightarrow$ Marginal willingness to pay (MWTP)

Marginal cost (MC) $\Rightarrow 10 + 5x$

External cost (total) $= 5x^2$

a) Finding x in market equilibrium:

Under perfect competition. Market equilibrium is given by MWTP = MC

$130 - 25x = 10 + 5x$

$120 = 30x$

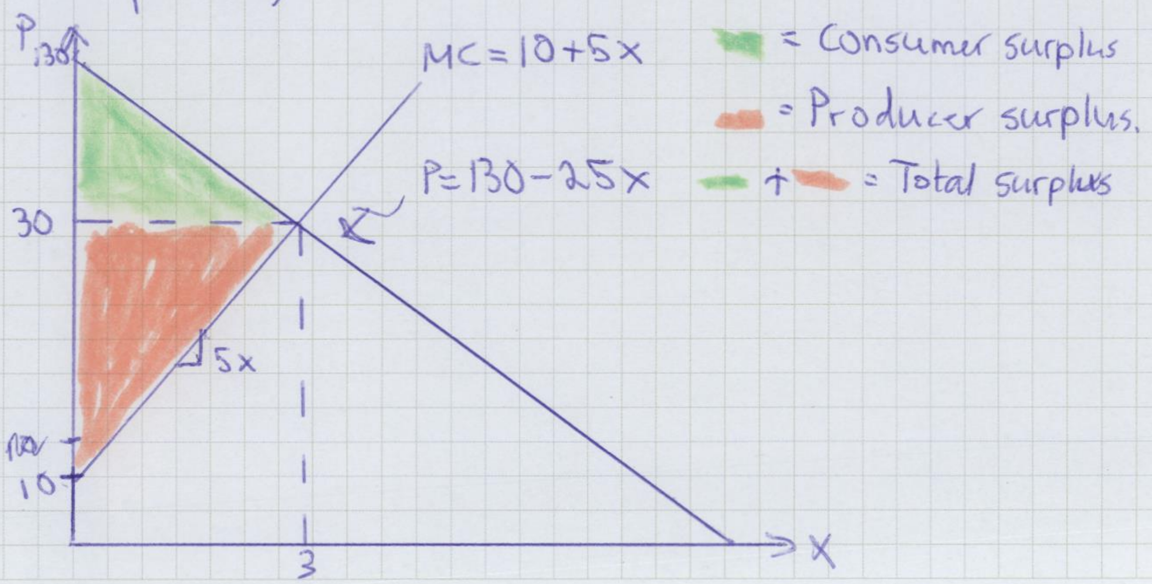
$x = \frac{120}{30} \Rightarrow \underline{\underline{x^* = 4}}$

$P = 130 - 25x$

$P = 130 - 25 \cdot 4$

$P = 30$

Graphically:



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Task 5b

Social efficient outcome of X

$\Rightarrow MC + MEC = MSC$

MC: Marginal cost; MEC: Marginal external cost; MSC: Marginal social cost

Taking the derivative of externality cost with respect to x:

$5x^2 \Rightarrow 10x$

$MC + MEC = 10 + 5x + 10x$

$MSC = 10 + 15x$

Negative externalities, are external costs that is socially inefficient. An example of a negative externality is pollution.
A firm that release a lot of emission when producing, is something a firm not necessarily will consider, but it will affect the society in terms of an increase in emission ⇒ Bad for the environment.
This causes an increase in the supply curve ⇒ which will reduce the amount of x produced, and lead to higher prices. and cause an efficiency loss.

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The optimal solution will now be:

Marginal willingness to pay = Marginal social cost

MWTP = MSC

$P = 130 - 25x$

$MSC = 10 + 15x$

$130 - 25x = 10 + 15x$

$120 = 15x + 25x$

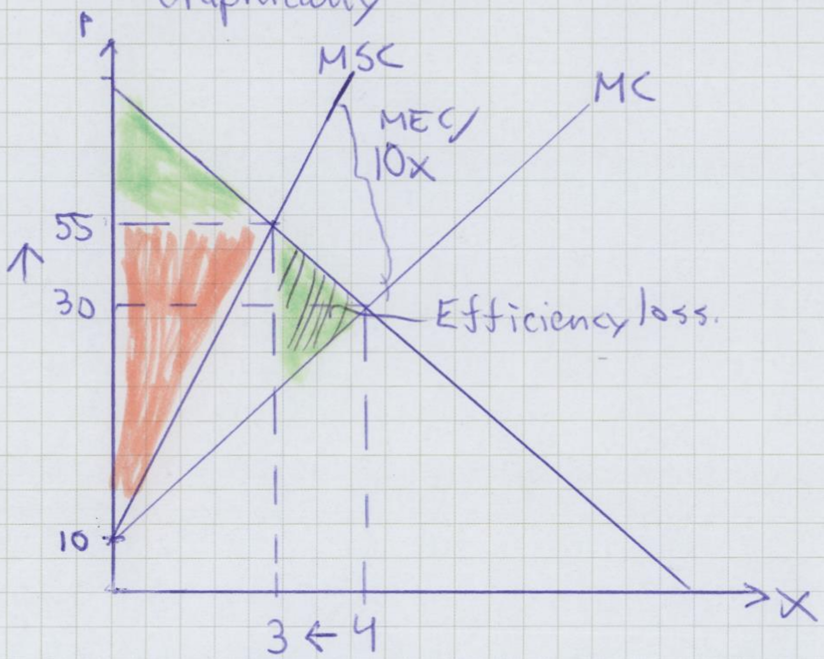
$120 = 40x$

$x^* = \frac{120}{40}$

$P = 130 - 25 \cdot 3 \quad P = 55$

$x^* = 3$

Graphically



Socially efficient output of $x = 3$

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Task 5c

Want to find a tax that will realize the socially efficient output of $x^* = 3$

Profit function: for the firm

$t \cdot x$ = tax revenue for the goverment

$$\pi = P(x) - c(x) - t \cdot x$$

~~marginal~~ Total revenue, costs, tax revenue

$$\max_x \pi = P - c'(x) - t = 0$$

$t = P - c'(x)$, from the graph, the difference between price and MC = MEC

To achieve socially efficient output:

$t = MEC$

$t = 10 \cdot x$

The socially efficient output of $x = 3$

$t = 10 \cdot 3$

$t = 30$

With a tax = 30, we are able to internalize the efficiency loss and ~~achieve~~ realize a socially efficient output

Håndtegning 21 av 23

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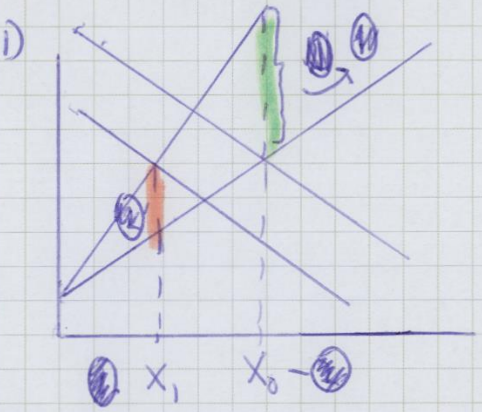
A challenge with the introduction of a tax, that the government faces, is the ability to set the correct tax when we are deling with ~~ext~~ a marginal externality that is increasing in x. Two cases:

i)



Tax rate when x is big

Tax rate when x is low.

① When x is low, the tax is low, but when x is large, the government will have to set a very high tax.

↳ Incentives for new firms to enter the market can be gone.

→ Firms must have the ability to pay the costs.

⇒ Can result in some firms going out of the market

② The optimal t, set by the government depends on market demand. Market demand is difficult to forecast.

And it can lead to the government setting the optimal tax either too low, or too high.

Another tool the government could use is quotas. This would ~~lead to it~~ give the government control of the output, (x).

~~By issuing a certain amount of quotas Kompr~~

Håndtegning 22 av 23

Fill out Question Code and Test Information on every sheet. Fyll inn oppgavekode og emneinformasjon på alle skisseark.

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Task 6

A public good is what we call non-rivalrous and non-excludable

- Non rivalrous goods mean that by consuming a good, it doesn't affect anyone else's chances for consuming it.

- Non-excludable goods mean that by consuming a good, it doesn't prevent anyone else from ~~using~~ consuming it too.

~~- A non-rivalrous good can for example be ...~~

An example of a public good can be national defence. As long as you are ~~...~~ within the country, you have the right to be protected. It doesn't affect or prevent anyone else from being protected.

~~Non-rivalrous~~	Non-excludable	Partly excludable
Non rivalrous	National defence	TV-signal
Partly rivalrous	A public beach.	An apple

Håndtegning 23 av 23

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- TV-signal is non-rivalrous and partly excludable, this is because it is available to everyone, but it is partly excludable because you have to pay for it in order to ~~consume~~ use it.

- A public beach is non-excludable in a way that it's no entry fees, and available to everyone who wants. But since it ~~is~~ limited space, it may occur that people can't find space on a crowdy day.

- An apple is both partly-rival and excludable in the way that in order ~~you have~~ to eat it, you have to pay, and by eating it, no one else can eat that apple.