10

a. Ignoring the externality, the consumers have identical Cobb-Douglass preferences for which the demands are $X = \frac{\alpha}{\alpha+\beta}\frac{m}{P_x}$

$m_a = 6p \quad m_b = 6$

and $y = \frac{\beta}{\alpha+\beta}\frac{m}{P_y}$

Normalizing and $P_y = 1$ $\quad p = \frac{P_x}{P_y}$

$$X_a = \frac{1}{1+2}\frac{6p}{p} = 2 \qquad y_a = \frac{2}{1+2}\frac{6p}{1} = 4p$$

$$X_b = \frac{1}{1+2}\frac{6}{p} = \frac{2}{p} \qquad y_b = \frac{2}{1+2}\frac{6}{1} = 4$$

$$Z_a = X_a - \omega_a^x + X_b - \omega_b^x = 2 - 6 + \frac{2}{p} - 0 = \frac{2}{p} - 4$$

aggregate excess demand is 0:

$$\frac{2}{p} - 4 = 0$$

$$p = \frac{1}{2}$$

allocations: a: $(2, 2)$

b: $(4, 4)$

b. No it is not Pareto efficient, b's consumption of x imposes a negative externality on a. a would pay b in y for consuming less of x, that is a Pareto-improvement.

It is important that there are many consumers. If a consumer of type a is selling good x to someone of good b, they don't sufficiently affect the average consumption of xb so they will go to the pareto-inefficient equilibrium and sell too much of x to b consumers

Now you can model Xb = 6 - Xa and that way internalize the externality

c. ~~Coases theorem states that Bargaining~~
By Coase's theorem, they would get to a Pareto-efficient outcome! They can directly negotiate ~~cost~~ transfers and allocations that internalize the externality.

d. - the relative price will go up as a would want to consume more x and b less.
- a will consume more x and y will consume less. a will consume less y and b more.

Show with edgeworth box

(2)

a. No, they benefit from ~~the~~ lying. The firm benefits from the externality so they will overreport b and the consumer is harmed from the externality so has an incentive to ~~over~~ overreport c.

b. ~~Truth-telling is~~ Truth-telling is weakly dominant

the tax and subsidy are the reported ones

	$h=0$	$h=D$
F	x	$x+b-c$
C	y	$y+b-c$

if $c > b$:
$h=0$ is Pareto-optimal and the ~~consumer~~ firms do not have an incentive to overreport ~~c~~ b as that would ~~also~~ also hurt them.

if $b > c$:
$h=D$ is Pareto-optimal and the consumer dont have an incentive to overreport c,

~~If $h=7$, the government gets~~

~~If $b \geq c$ and therefore~~

So again the resulting level of the externality will be Pareto-optimal.

- if $h=0$, there are no transfers so nothing happens to the Budget
- if $b > c$ and $h = 7$, the government gets c and subsidises b, and as $b \geq c$, it will will have to net pay. ~~So the Budget~~

In general equilibrium, you could make the point that overreporting might make sense as you're forcing the other to pay more tax

(b) $\eta = 24$ $\quad \pi = w_F + 24h - 2h^2$

I) $\max_h \pi = w_F + 24h - 2h^2$

FOC:

$$\frac{d\pi}{dh} = 24 - 4h = 0$$

$$4h = 24$$

$$h^* = 6$$

II) to find the Pareto optimum, we need to merge the ~~F~~ firm and the consumer to ~~[illegible]~~ maximise the social welfare function:

$$\max_h W = w_F + 24h - 2h^2 + w_C - h^2$$

$$\frac{dW}{dh} = 24 - 6h = 0$$

$$h^{**} = 4$$

this is the Pareto-optimal pollution

so you set the quota for the firm ~~at~~ 4

#) the profit function becomes

$$\max_h \; \pi = w_F + 24h - 2h^2 - ht$$

FOC:

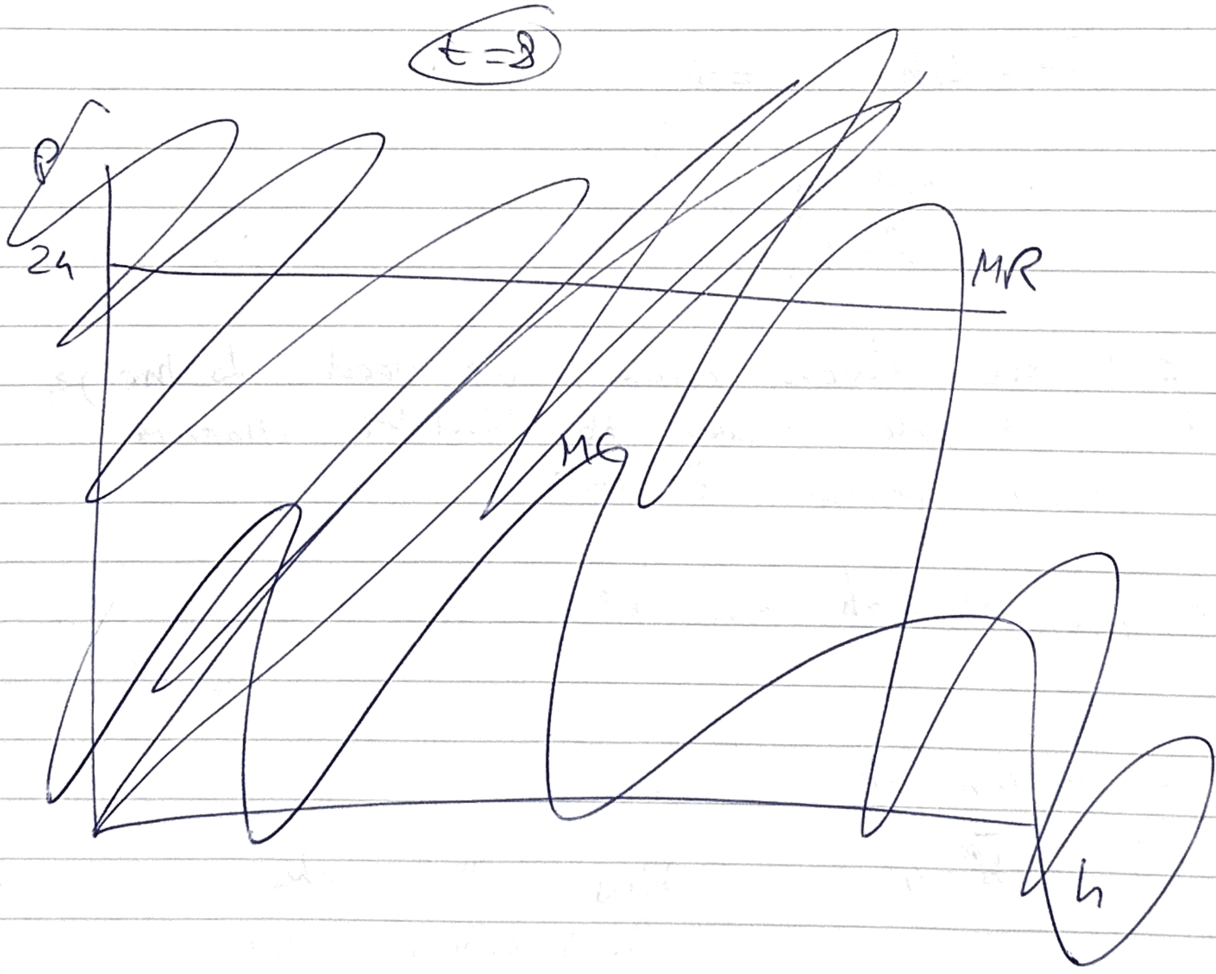
$$\frac{d\pi}{dh} = 24 - t - 4h = 0$$

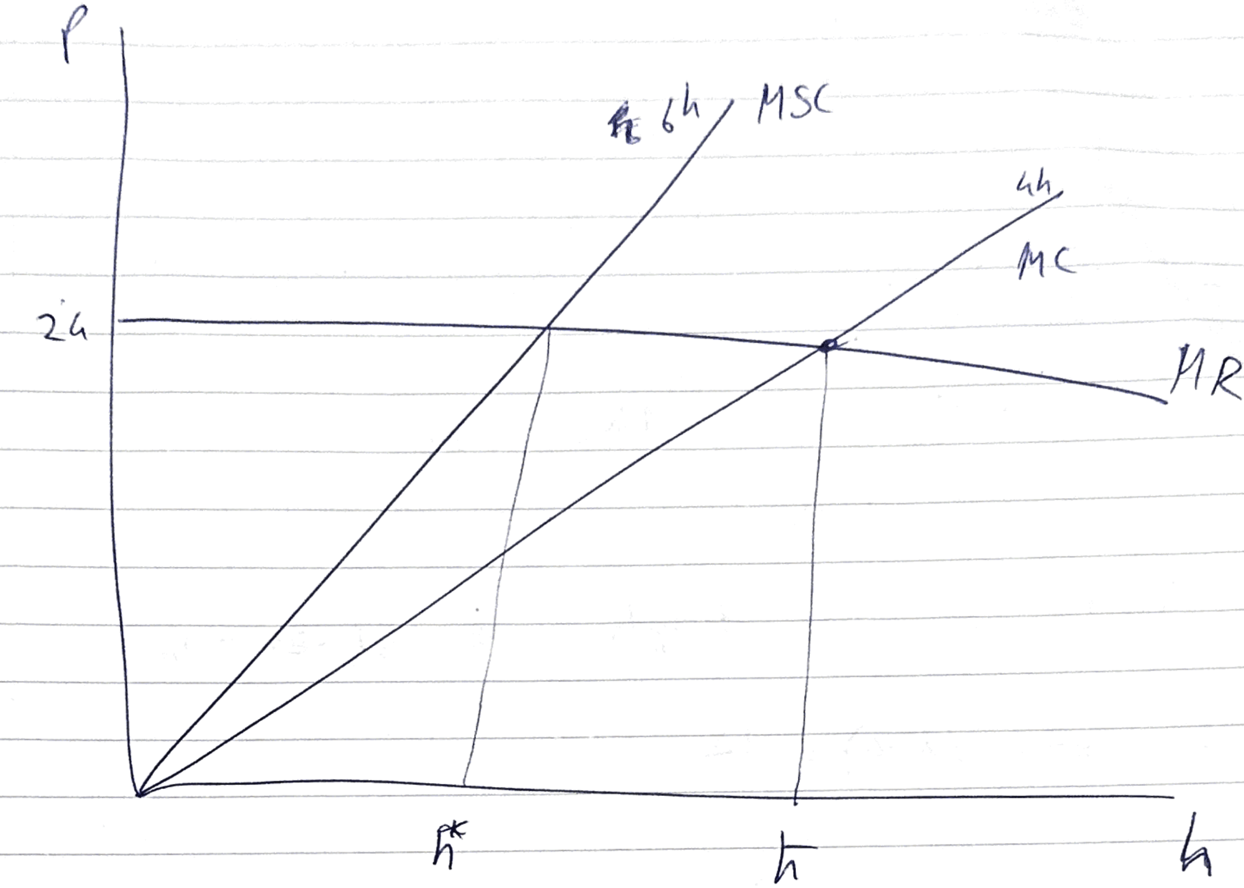
$$h = 6 - \frac{1}{4}t$$

we want $h = 4$:

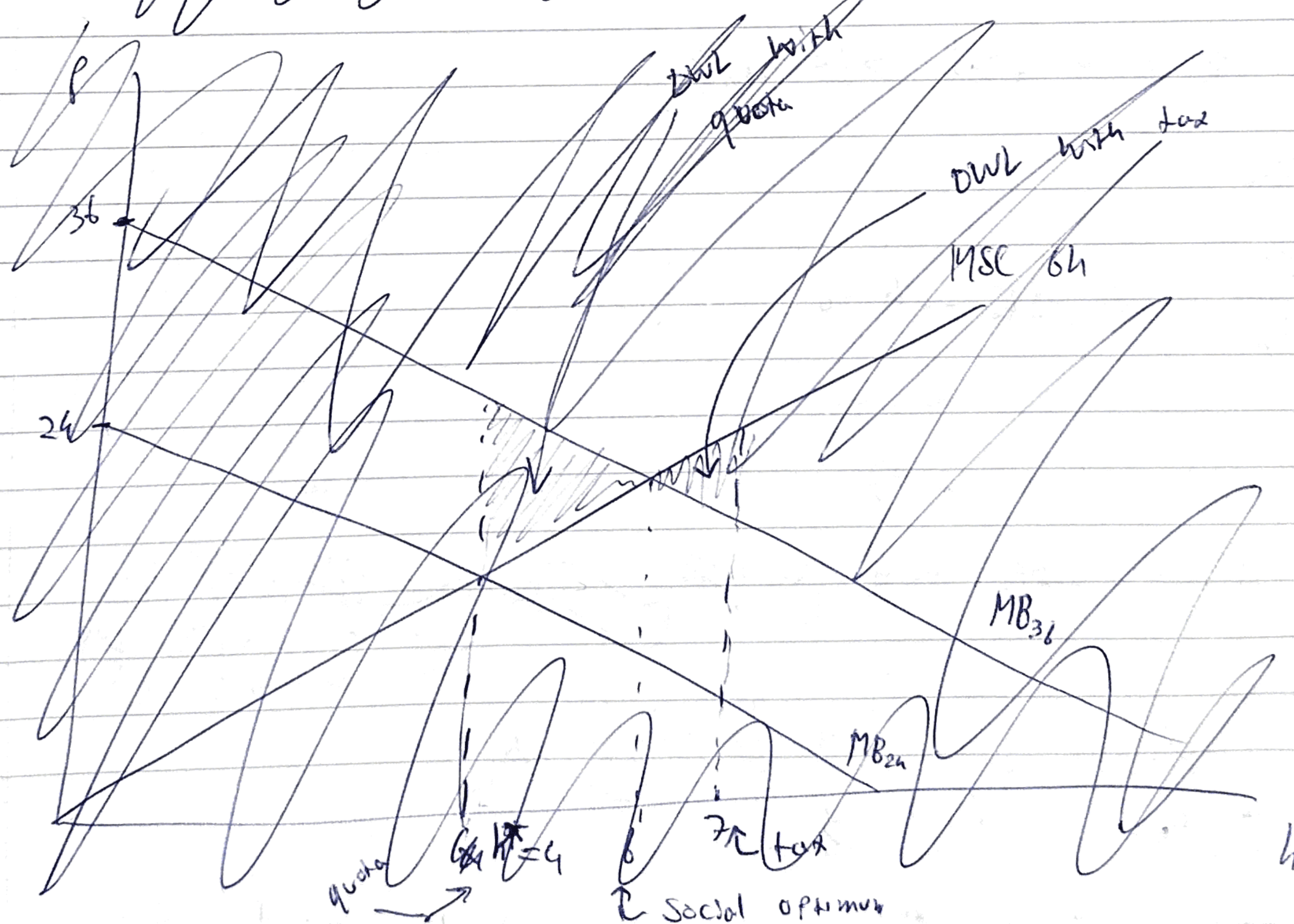
$$4 = 6 - \frac{1}{4}t$$

$$t = 8$$





b. ~~MB curve is 36 − 4h~~



I) $\max_h W = WF + 36h - 3h^2 + WC$

FOC

$$\frac{dW}{dh} = 36 - 6h = 0$$

$h = 6$ at the new social optimum.

the height of the triangle is $36 - 24 = 12$

$$DWL_{quota} = \frac{1}{2}\cdot 12\,(6-4) = 12$$

II) with the old tax, the profit function for the firm is:

$$\max_h \pi = WF + 36h - 2h^2 - 8h$$

FOC:

$$\frac{d\pi}{dh} = 36 - 8 - 4h = 0$$

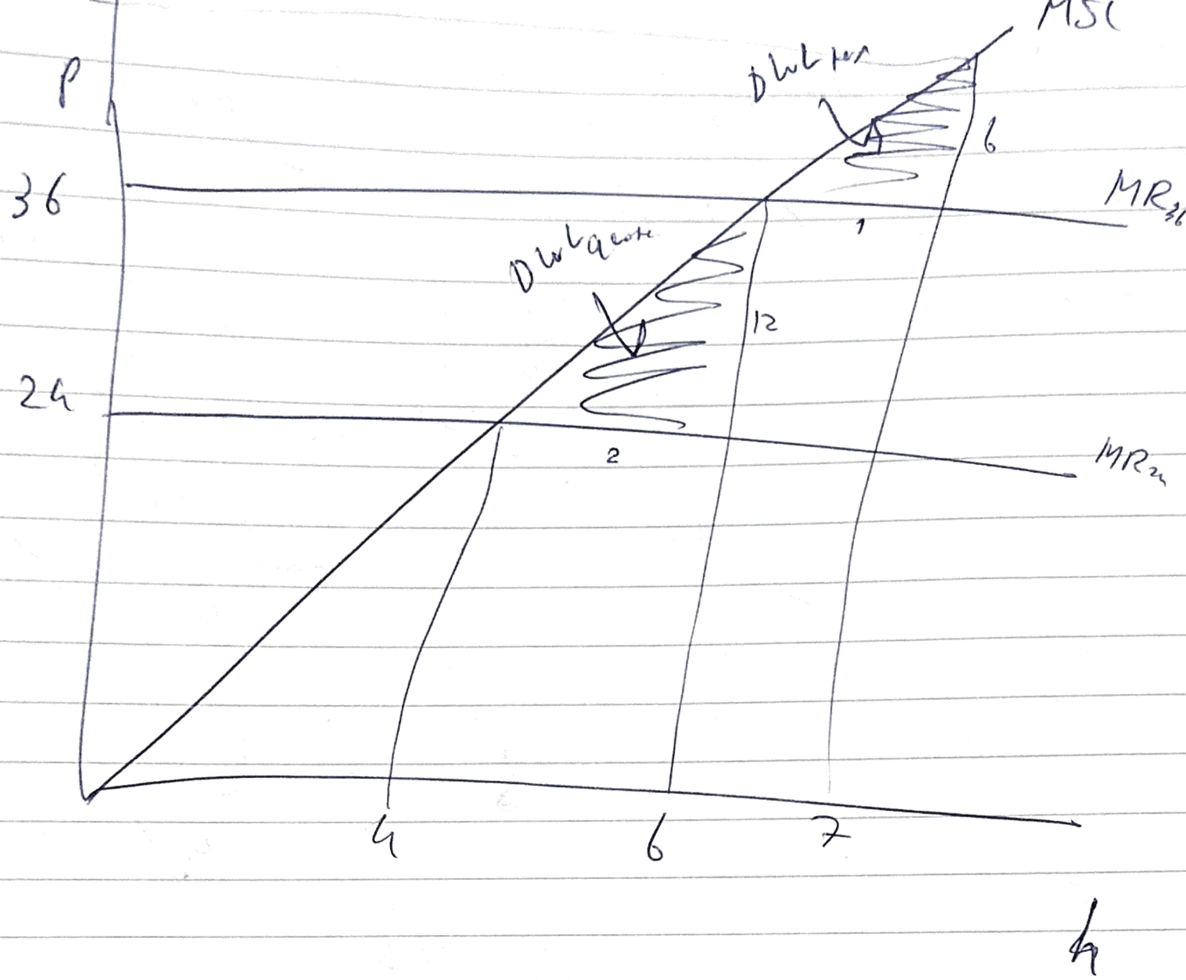
$$4h = 28$$

$$h = 7$$

~~height of the triangle is~~ $\cancel{6h - (36 - 4h)}$ $\cancel{= 42 - (36 - 28) = 34}$

$\cancel{DWL_{tax} = \frac{1}{2}\cdot 34 \cdot (7-6) = 17}$

$$DWL_{tax} = \frac{1}{2}\cdot 6 \cdot 1 = 3$$



Also look at problems 8 & 9