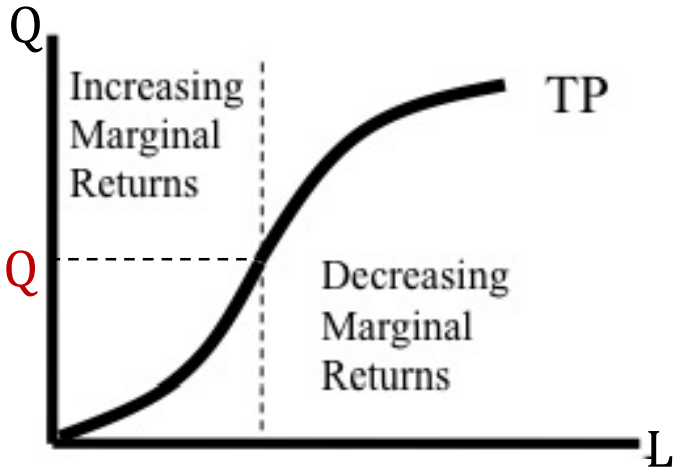
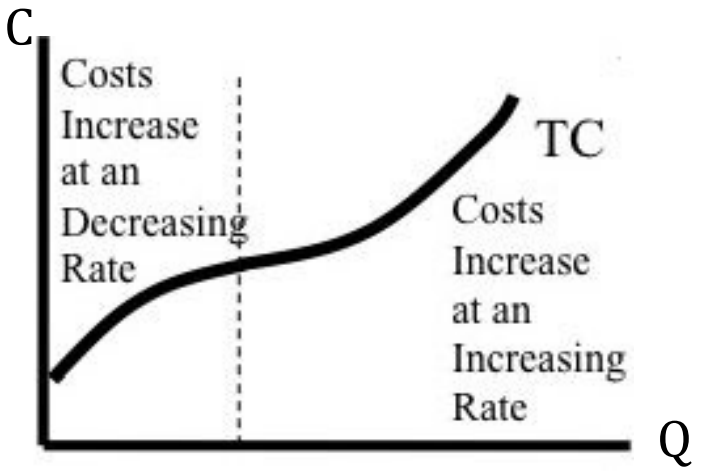
Introductory Microeconomics

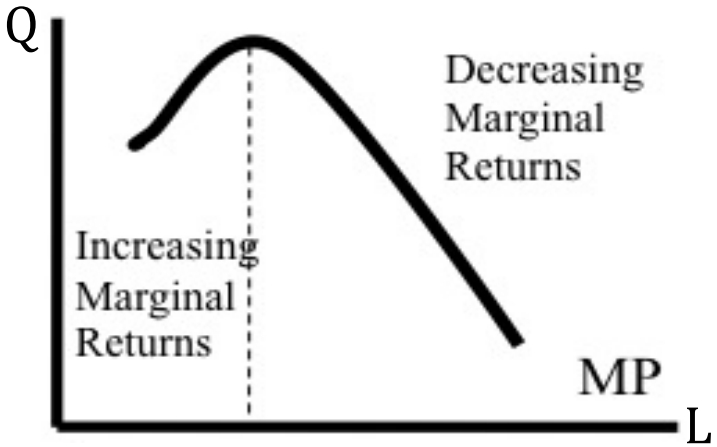
Tutorial 9

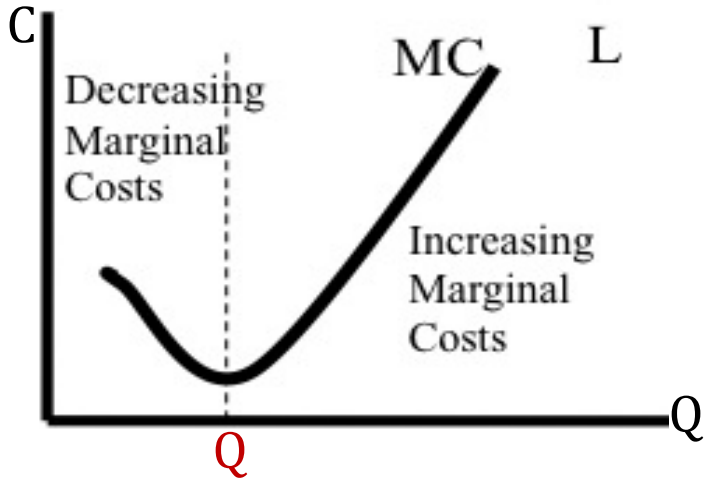
Nhan La

Production functions









Market competition

- Perfectly competitive market:
  - Total revenue: $TR = P \times Q$
  - Marginal/Average revenue: $AR = MR = \frac{TR}{Q} = P$
- Imperfectly competitive market:
  - Total revenue: $TR(Q) = P(Q) \times Q$
  - Average revenue: $AR(Q) = \frac{TR(Q)}{Q} = \frac{P(Q) \times Q}{Q} = P(Q)$
  - Marginal revenue:

$$MR(Q) = \frac{\partial TR(Q)}{\partial Q} = \frac{\partial P(Q) \times Q}{\partial Q} = P(Q) + Q\frac{\partial P(Q)}{\partial Q} = AR(Q) + Q\frac{\partial P(Q)}{\partial Q}$$

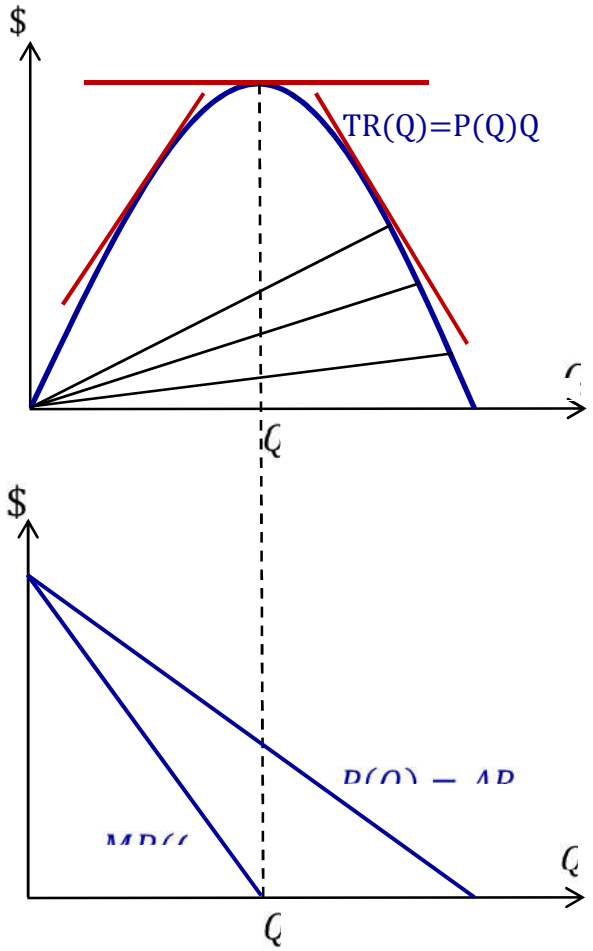
  - By applying: $\frac{\partial f(x)g(x)}{\partial x} = f(x)\frac{\partial g(x)}{\partial x} + g(x)\frac{\partial f(x)}{\partial x}$

Price and quantity decision

- $P(Q) = AR$
  - *Market demand curve*
- $TR(Q) = P(Q) \times Q = AR(Q) \times Q$
  - Concave $TR(Q)$
- $MR(Q) = AR(Q) + Q\frac{\partial P(Q)}{\partial Q}$
  - $MR(Q) < AR(Q)$
- $MR(Q) > 0 \Rightarrow \varepsilon_D < -1$

$$P(Q) + Q\frac{\partial P(Q)}{\partial Q} > 0$$

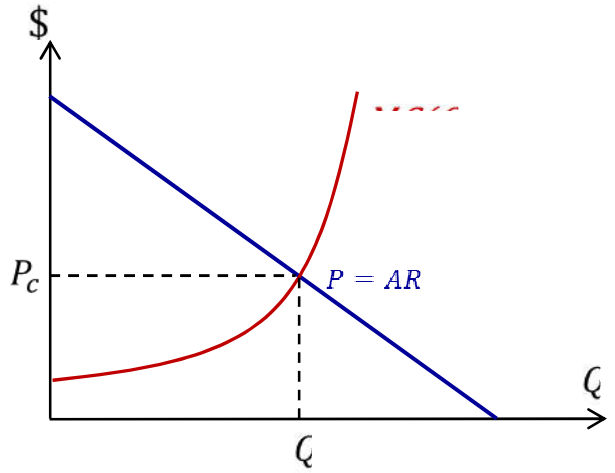
$$\Rightarrow P(Q) > -Q\frac{\partial P(Q)}{\partial Q} \Rightarrow \frac{P}{Q}\frac{\partial Q}{\partial P} < -1$$



Profit maximisation

- Perfectly competitive market:

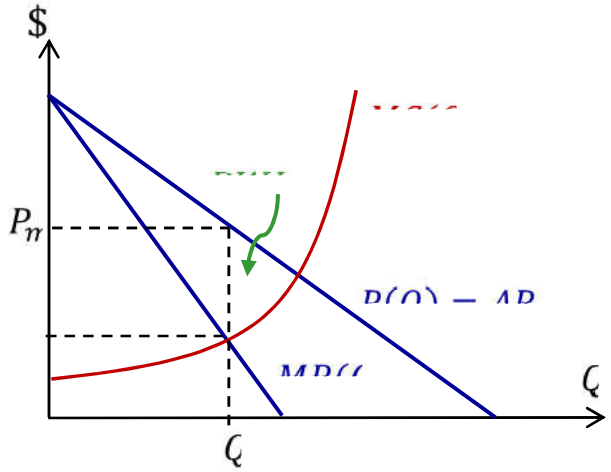
$MR = P = MC(Q)$



- Imperfectly competitive market:

$MR(Q) = MC(Q)$

- Dead weight loss



Task 1

a/

Q	P	TR $(P \times Q)$	MR $(TR_{t+1} - TR_t)$
0	80	$0 \times 80 = 0$	
1	70	$1 \times 70 = 70$	70-0=70
2	60	120	120-70=50
3	50	150	30
4	40	160	10
5	30	150	-10
6	20	120	-30
7	10	70	-50

Task 1

b/

Q	FC	MC	VC $(Q \times MC)$	SRTC $(VC + FC)$	SRATC $\left(\frac{TC}{Q}\right)$
0	60			60	
1	60	20	$1 \times 20 = 20$	60+20=80	80
2	60	20	$2 \times 20 = 40$	60+40=100	50
3	60	20	60	120	40
4	60	20	80	140	35
5	60	20	100	160	32
6	60	20	120	180	30
7	60	20	140	200	28.57
8	60	20	160	220	20

Task 1

b/

Q	FC	AFC	VC	AVC	SRATC (AFC +AVC)
0	60				
1	60	60	20	20	80
2	60	30	40	20	50
3	60	20	60	20	40
4	60	15	80	20	35
5	60	12	100	20	32
6	60	10	120	20	30
7	60	8.6	140	20	28.57
8	60	7.5	160	20	20

Task 1

c/

Q	MR $(TR_{t+1} - TR_t)$	MC
0		
1	70	20
2	50	20
3	30	20
4	10	20
5	-10	20
6	-30	20
7	-50	20

Task 2

Demand: $Q = 20 - 0.5P \Rightarrow 0.5P = 20 - Q$

Inverse demand: $AR = P(Q) = 40 - 2Q$

Total revenue: $TR(Q) = P(Q) \times Q = 40Q - 2Q^2$

Total cost: $TC(Q) = 4 - Q + 0.5Q^2$

a/ $MC(Q) = \frac{\partial TC(Q)}{\partial Q} = -1 + Q$

$MR(Q) = \frac{\partial TR(Q)}{\partial Q} = 40 - 4Q$

In monopoly market, to maximise profit firm sets:

$MR(Q) = MC(Q)$

$40 - 4Q = -1 + Q$

$Q_m = 8.2$; $P_m = 40 - 2 \times 8.2 = 23.6$

$\Pi = TR(Q) - TC(Q) = 8.2 \times 23.6 - (4 - 8.2 + 0.5 \times 8.2^2) = 164.1$

Task 2

Demand: $Q = 20 - 0.5P$

Inverse demand: $P(Q) = 40 - 2Q$

Total revenue: $TR(Q) = P(Q) \times Q = 40Q - 2Q^2$

Total cost: $TC(Q) = 4 - Q + 0.5Q^2$

$$MC(Q) = \frac{\partial TC(Q)}{Q} = -1 + Q$$

b/ In competitive market, to maximise profit firm sets:

$MC(Q) = P(Q)$

$\Rightarrow -1 + Q = 40 - 2Q$

$Q_c = 13.7$

$P_c = MC = -1 + 13.7 = 12.7$

Task 2

c/

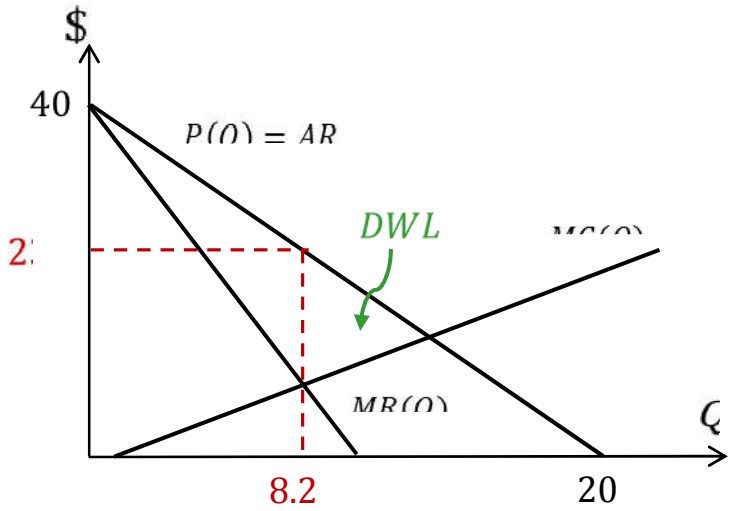
i) $Q_c = 13.7 > 8.2 = Q_m$

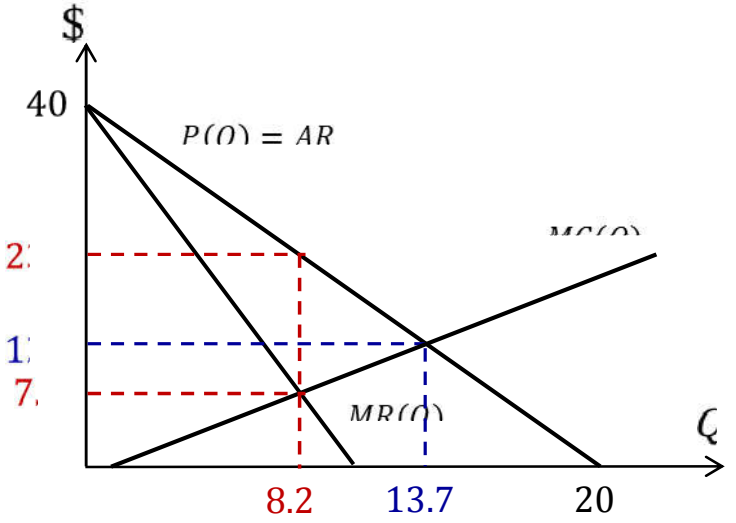
$P_c = 12.7 < 23.6 = P_m$

ii)

- Monopoly: MR = private marginal benefit
- Competitive: P(Q) = social marginal benefit
- Total surplus gain = DWL

$$DWL = \frac{(23.6-7.2)\times(13.7-8.2)}{2} = 45.1$$



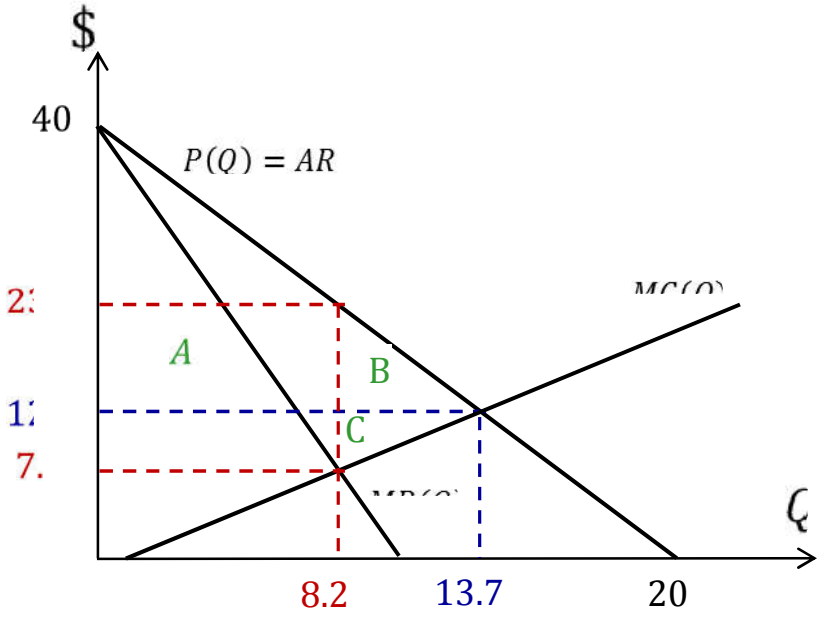


Task 2

c/

iii)

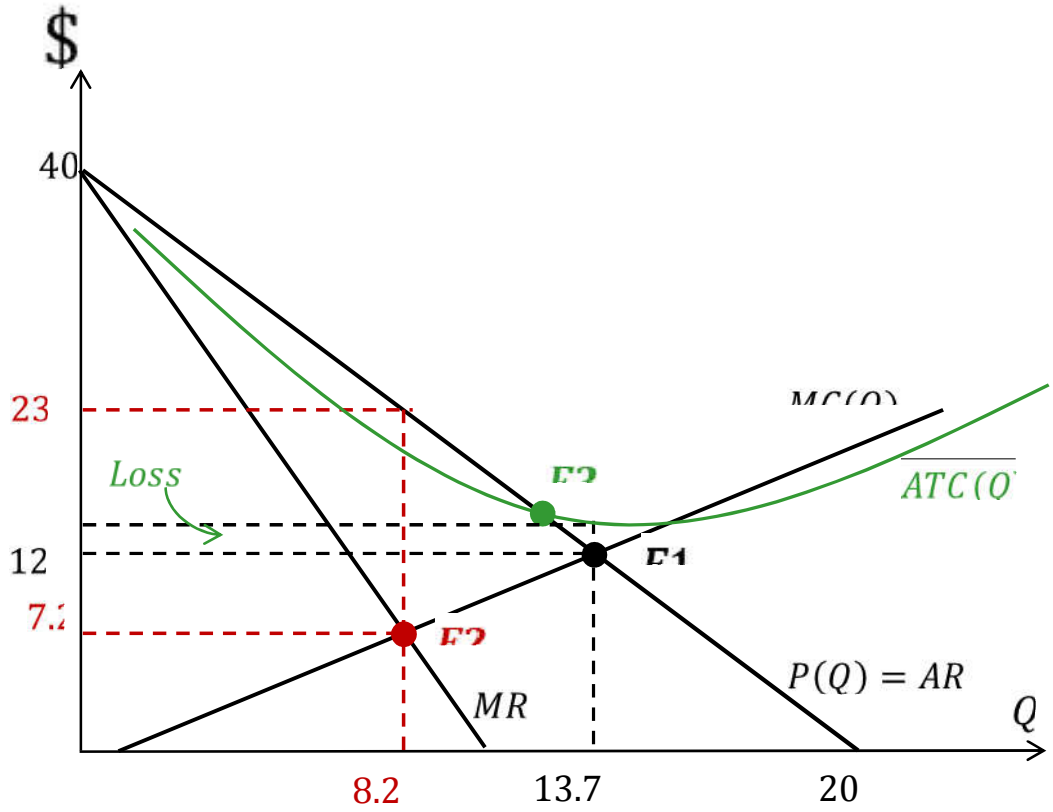
- Consumer surplus: $A + B$
  - $A = \{(23.6 - 12.7) \times 8.2\} = 90.2$
  - $B = \frac{(23.6-12.7)\times(13.7-8.2)}{2} = 30.25$
  - Consumer surplus = 120.45
- Producer surplus: $-A + C$
  - $C = \frac{(12.7-7.2)\times(13.7-8.2)}{2} = 14.85$
  - Producer surplus = -75.35



- Again, it shows:
  - Total surplus gain $= CS + PS = (A + B) + (-A + C) = B + C = DWL$

Task 2

d/ Average pricing



Task 2

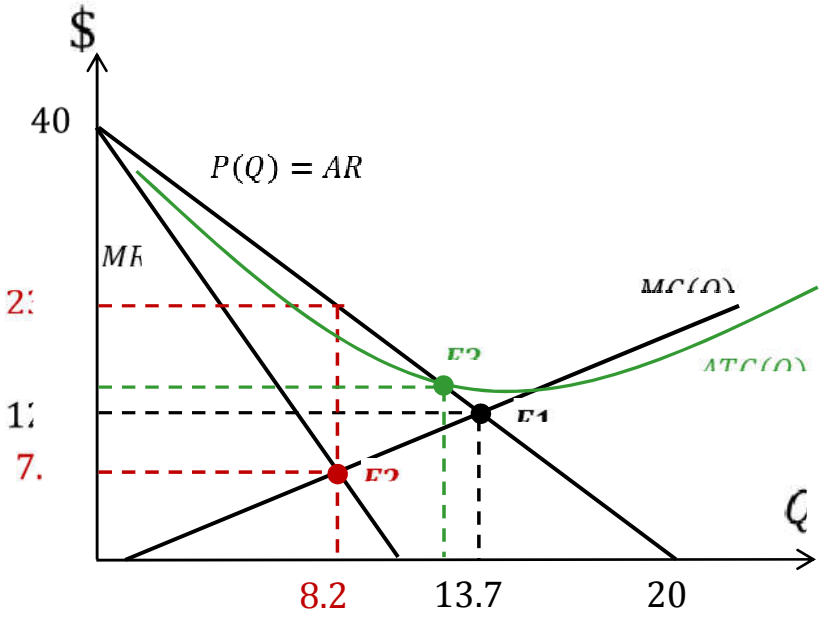
d/ Average pricing

- E1: Market efficient p=MC
  - Subsidy for firm loss
- E2: Monopoly
  - Substantial dead weight loss
- E3: Set P = ATC
  - Firm makes no profit. Why?

$\Pi = TR(Q) - TC(Q)$

$\Rightarrow \Pi = P \times Q - ATC \times Q$

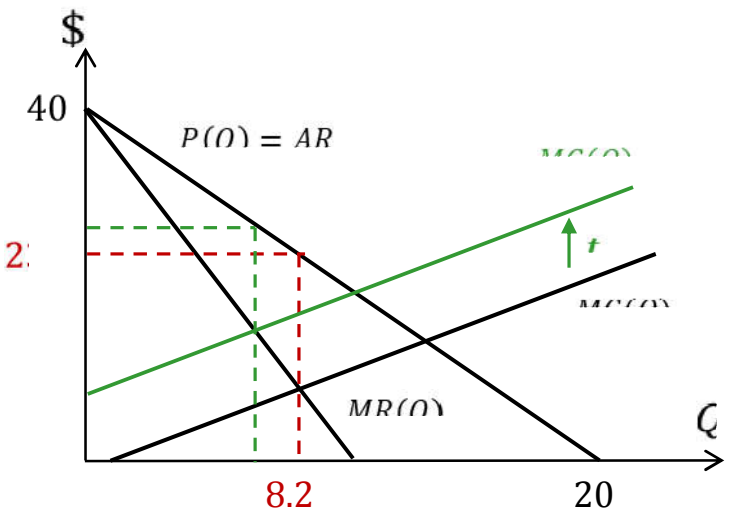
$\Rightarrow \Pi = Q(P - ATC) = 0$



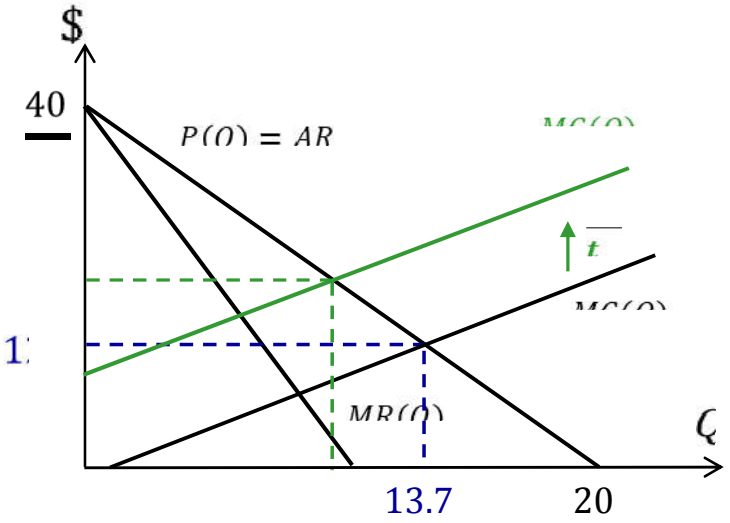
Task 2

e/ Tax on the product produced, or supply side

Monopoly



Competitive



Task 2

e/

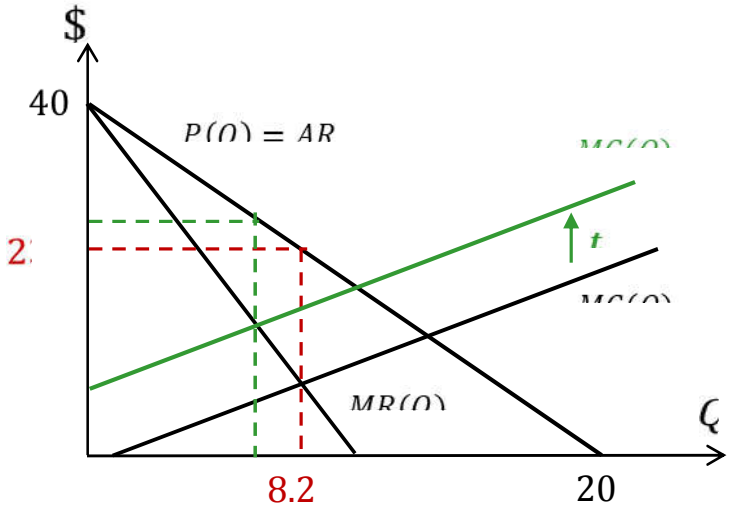
Monopoly

$$MC(Q)_t = MC(Q) + t$$

Profit maximisation:

$$MC(Q)_t = MR(Q)$$

Solve for $Q_{m,t}$ and $P_{m,t}$



Task 2

e/

Competitive

$$MC(Q)_t = MC(Q) + t$$

Profit maximisation:

$$MC(Q)_t = P(Q)$$

Solve for $Q_{c,t}$ and $P_{c,t}$