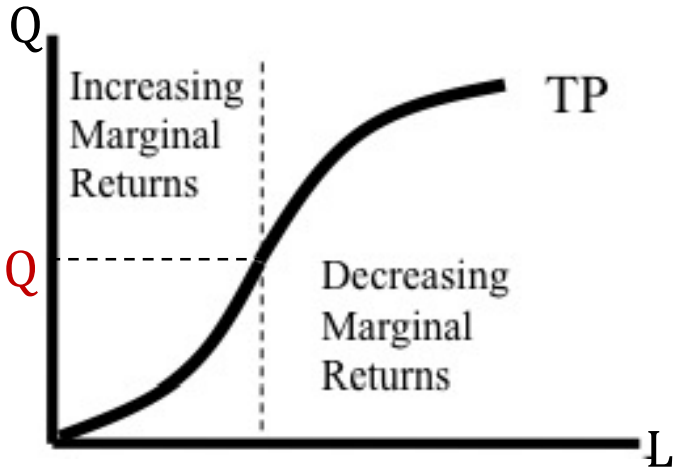
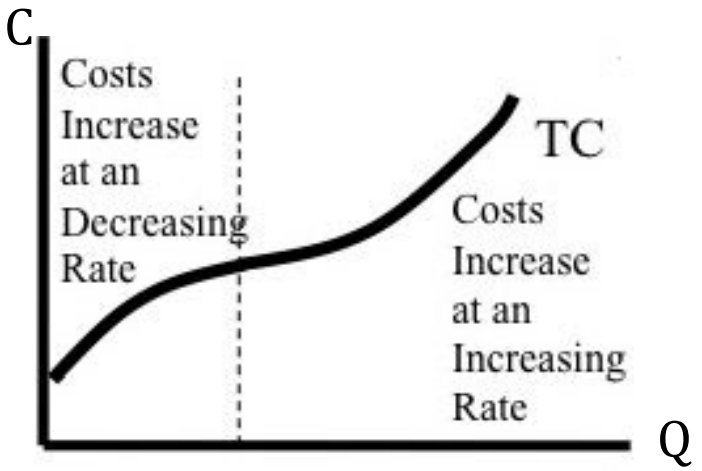
Introductory Microeconomics

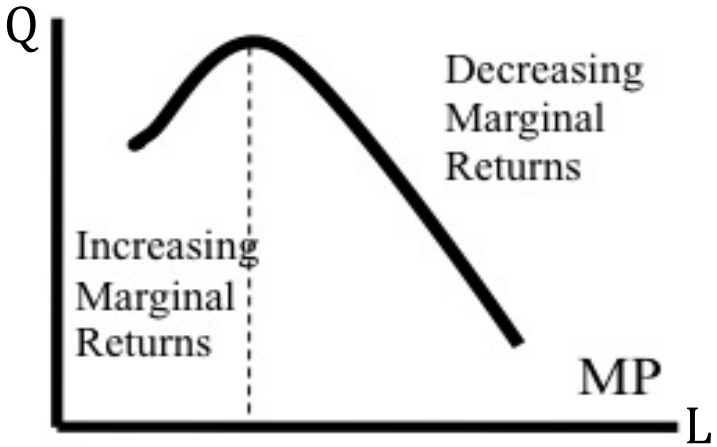
Tutorial 8

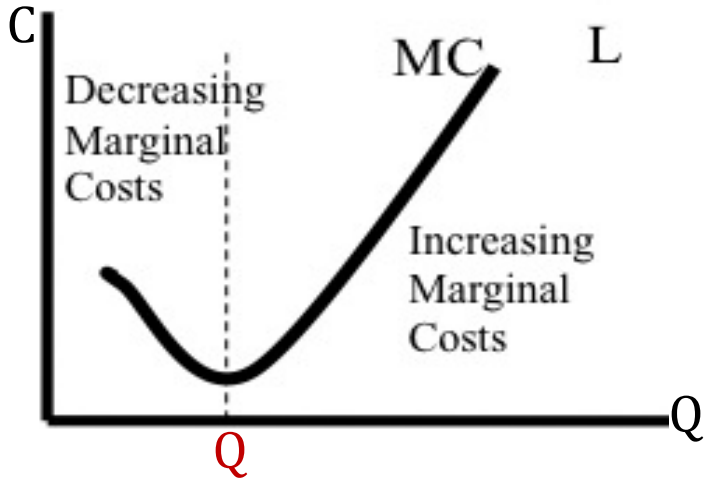
Nhan La

Production functions









Production functions

Total Product: $TP(L) = Q(L)$

Marginal Product: $MP(L) = \frac{\partial Q(L)}{\partial L}$

Total cost: $SRTC(Q) = FC + VC(Q)$

Marginal cost: $SRMC(Q) = \frac{\partial SRTC(Q)}{\partial Q} = \frac{\partial VC(Q)}{\partial Q} = \frac{w}{MP(Q)}$

- Supply curve $(SRMC > AVC)$

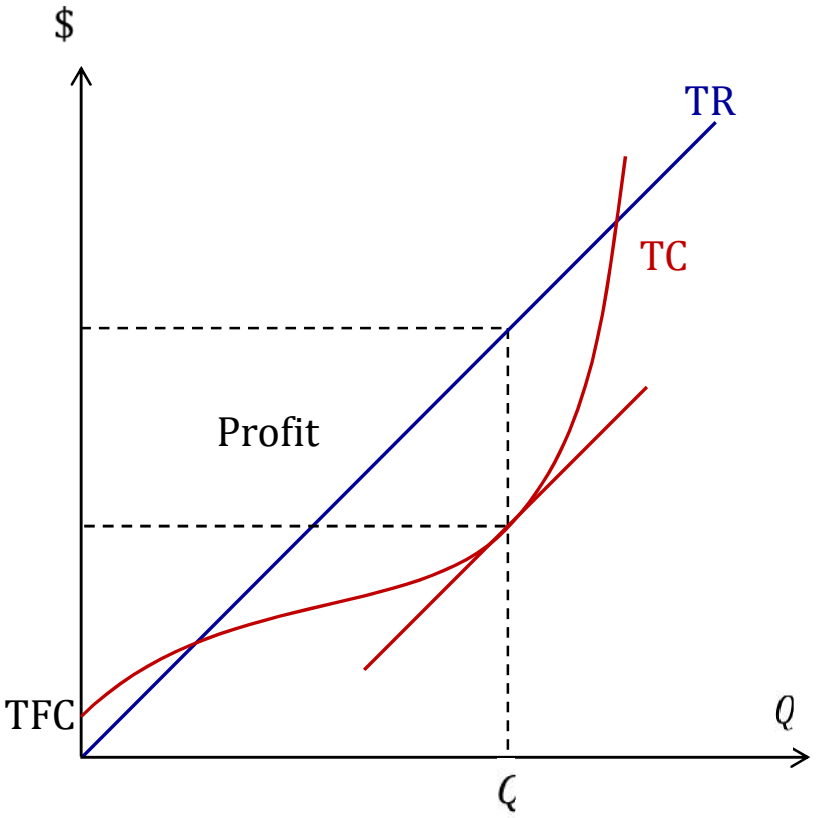
Total Revenue: $TR = P \times Q$

Marginal/Average revenue: $AR = MR = \frac{TR}{Q} = P$

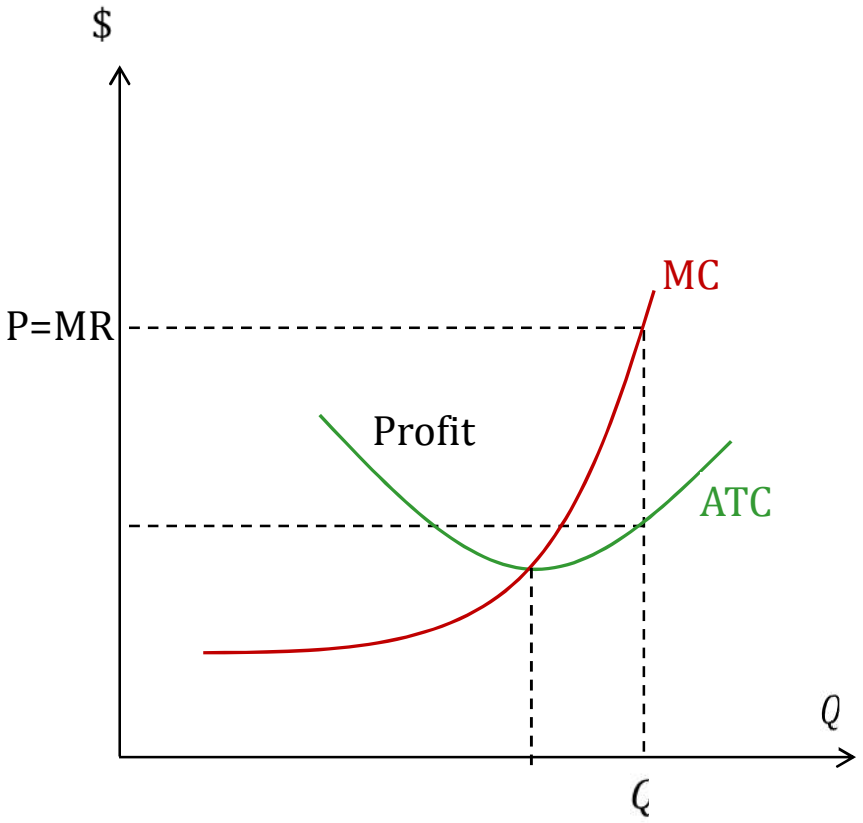
- Demand curve

Profit maximisation

Total decision



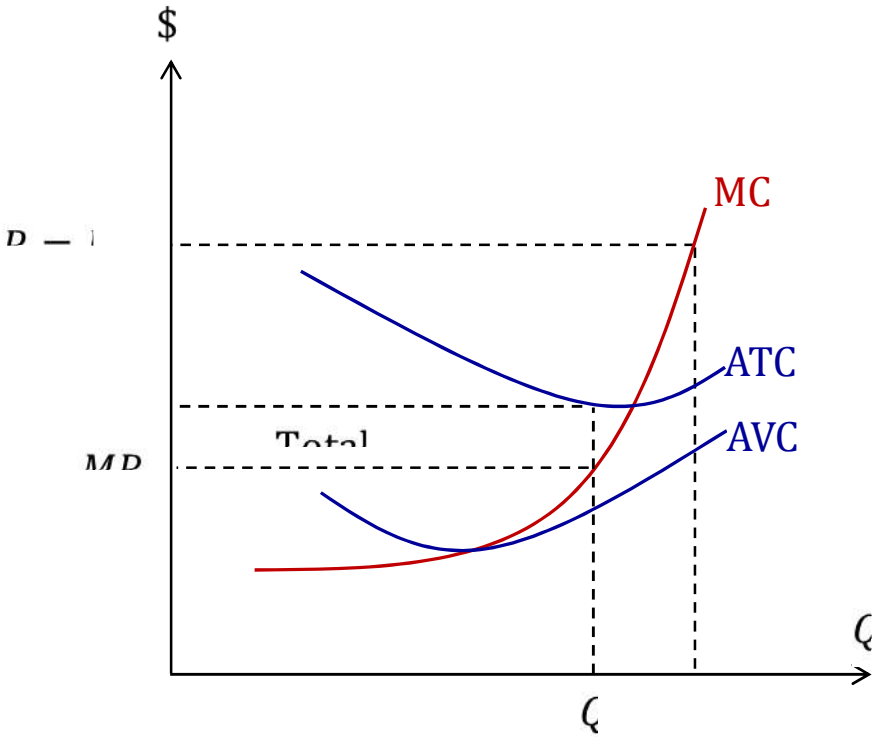
Marginal decision



Short run decision

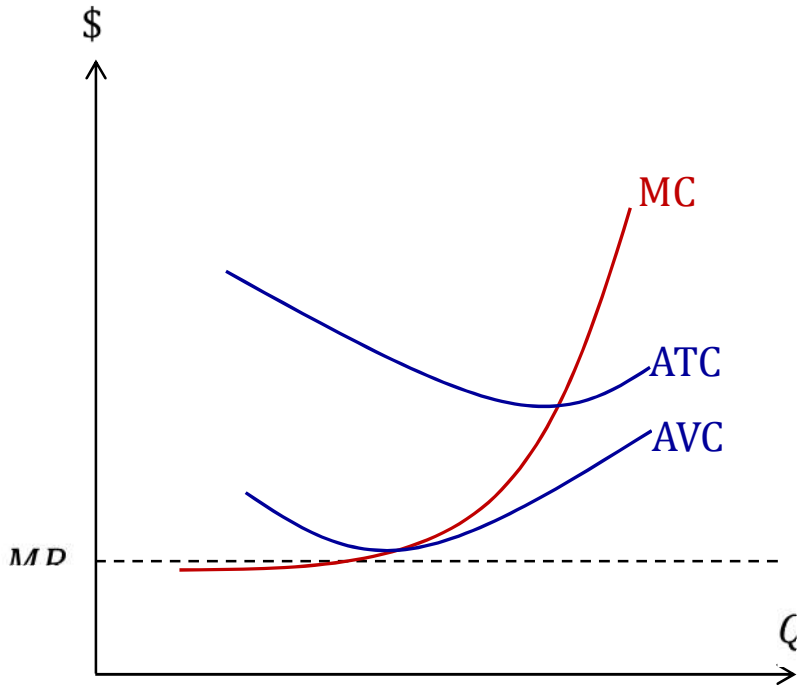
Operate

$$MR = P > AVC(Q)$$



Exit

$$MR = P < AVC(Q)$$



Task 1

a/

Events	VC	SRMC $(TC_{t+1} - TC_t)$	FC	SRTC $(VC + FC)$		[illegible]
0	0	-	500	500+0= 500	-	-
1	1000	1500-500= 1000	500	1000+500= 1500	1000/1= 1000	1500/1= 1500
2	2400	1400	500	2900	1200	2900/2= 1450
3	4200	1800	500	4700	1400	1566.7
4	6400	2200	500	6900	1600	1725
5	9000	2600	500	9500	1800	1900

Task 1

b/ $\mathrm{P} = \mathrm{AR} = MR = 1{,}500$

Events	VC	SRMC $(TC_{t+1} - TC_t)$	FC	SRTC $(VC + FC)$	[illegible]	[illegible]
0	0	-	500	500	-	-
1	1000	1000	500	1500	1000	1500
2	2400	1400<1500	500	2900	1200	1450
3	4200	1800	500	4700	1400	1566.7
4	6400	2200	500	6900	1600	1725
5	9000	2600	500	9500	1800	1900

c/ $\Pi = TR - TC = P * Q - TC = 1500 \times 2 - 2900 = 100$

Task 2

Entry/exit: $TR \lessgtr TVC \Leftrightarrow MR = AR = P \lessgtr AVC$

Profit: $TR \lessgtr TC \Leftrightarrow MR = AR = P \lessgtr ATC$

a/ $TC(Q) > TR(Q)$

$\Rightarrow TFC + TVC(Q) > TR(Q)$

Need more information

b/ $TVC(Q) > TR(Q)$

$\Rightarrow AVC > AR = MR = P$

Shut down

Task 2

Entry/exit: $TR \lessgtr TVC \Leftrightarrow MR = AR = P \lessgtr AVC$

Profit: $TR \lessgtr TC \Leftrightarrow MR = AR = P \lessgtr ATC$

c/ $MR(Q) > MC(Q)$

Need more information

d/ $TR(Q) > TFC$

Need more information

e/ $\mathrm{MR} = \mathrm{AR} = P > ATC$

Produce

Task 3

$AR = MR = P = 80$; $FC = 1000$; $VC(Q) = 10Q + Q^2$

a/

$SRTC = FC + VC = 1000 + 10Q + Q^2$

$SRAFC = \frac{FC}{Q} = \frac{1000}{Q}$

$SRAVC = \frac{VC}{Q} = 10 + Q$

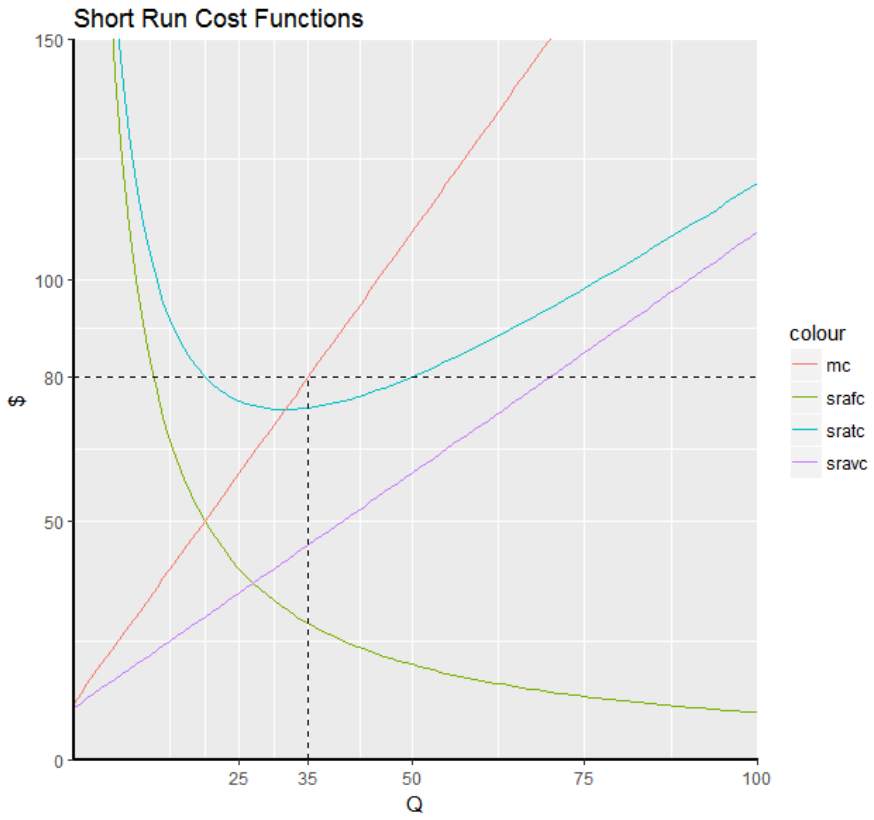
$SRATC = \frac{SRTC}{Q} = \frac{1000}{Q} + 10 + Q$

$MC = \frac{\partial SRTC}{\partial Q} = 10 + 2Q$

Task 3

b/ As Q increases:

- SRAFC monotonically decreases
- SRAVC increases
- SRATC lies above SRAVC but these lines catch up
  - Why? SRAFC decreases
- MC goes through the minimum on SRAVC and SRATC



Task 3

c/

$MR = AR = P = 80$

$TC = 1000 + 10Q + Q^2$

$MC = 10 + 2Q$

To maximise profit firm sets:

$MR = P = MC \Leftrightarrow 80 = 10 + 2Q^* \Leftrightarrow Q^* = 35$

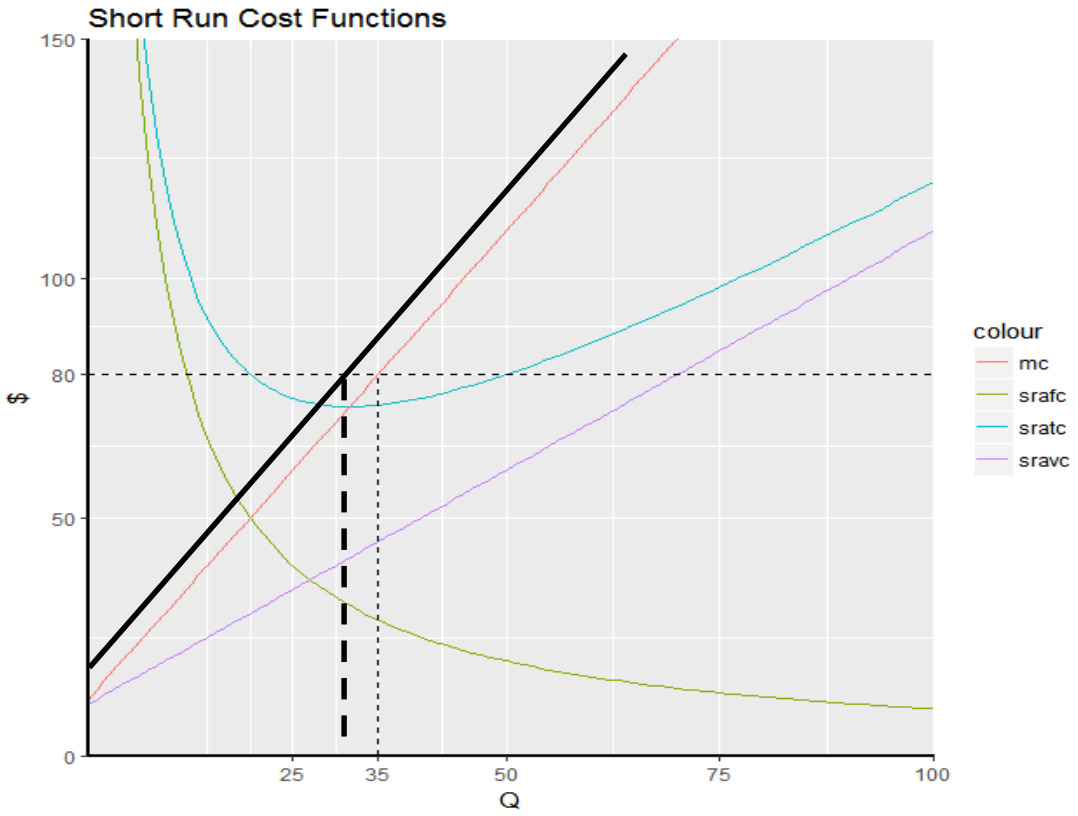
$TR = PQ^* = 80 \times 35 = 2800$

$TC = 1000 + 10 \times 35 + 35^2 = 2575$

$\Pi = TR - TC = 2800 - 2575 = 225$

Task 3

d/ Tax on restaurant: Shift the supply curve (MC) upward



Task 3

d/ Tax on restaurant:

$VC = 4Q + 10Q + Q^2$

$VC = 14Q + Q^2$

Supply: $MC = 14 + 2Q$ (Compare with before tax: $MC = 10 + 2Q$)

Still, to maximise profit firm sets:

$MR = P = MC \Leftrightarrow 80 = 14 + 2Q^* \Leftrightarrow Q^* = 33$

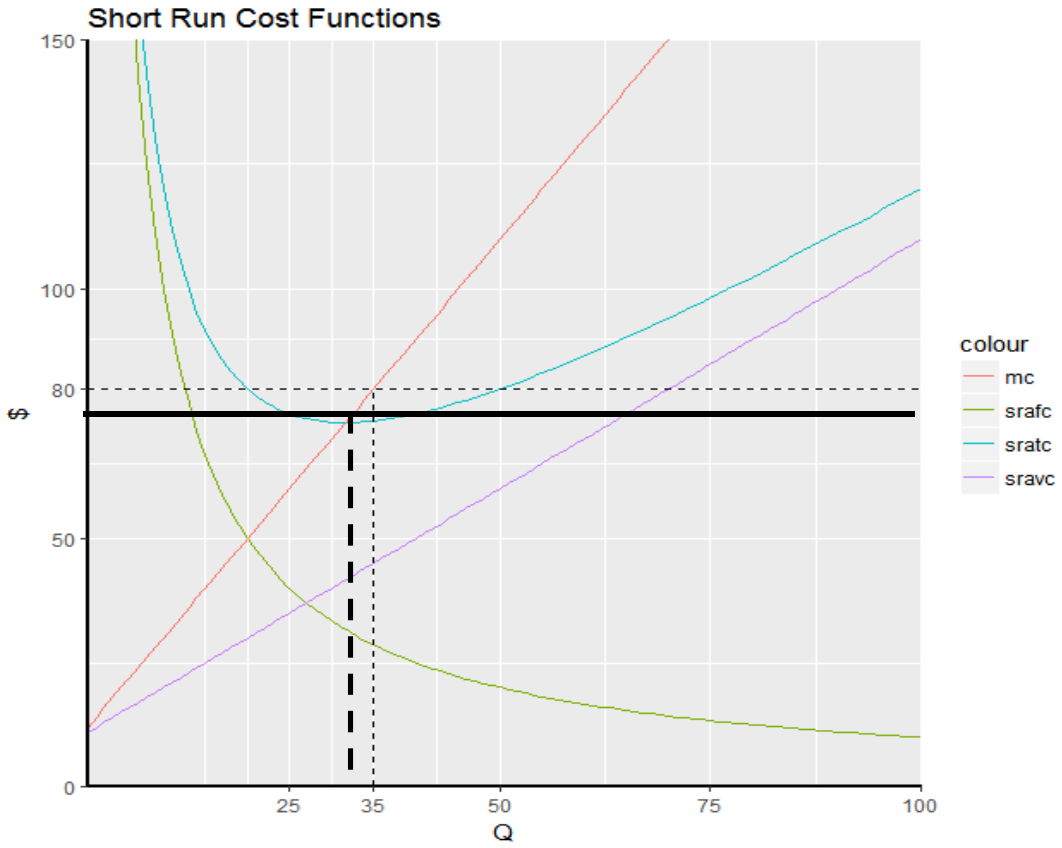
$TR = PQ^* = 80 \times 33 = 2640$

$TC = 1000 + 14 \times 33 + 33^2 = 2551$

$\Pi = TR - TC = 2640 - 2551 = 89$

Task 3

d/ Tax on customers: Shift the demand curve (or market price) downward



Task 3

d/ Tax on customers:

Demand: $MR = P = 80 - 4 = 76$

Supply: $MC = 10 + 2Q$

Again, to maximise profit firm sets:

$MR = P = MC \Leftrightarrow 76 = 10 + 2Q^* \Leftrightarrow Q^* = 33$

$TR = PQ^* = 76 \times 33 = 2508$

$TC = 1000 + 10 \times 33 + 33^2 = 2419$

$\Pi = TR - TC = 2508 - 2419 = 89$