

Economics, Markets and Organizations (Tutorial 3)

Production function, costs and supply in the short and long run



Homework 1

- 1) Discuss the different types of elasticity of demand & their implications in our everyday life (food, entertainment, education, work etc.) Why is the midpoint formula for the elasticity of demand necessary? Provide an example.





Homework 2

- How does the consumer chooses her consumption over two goods subject to her budget constraint? Explain the income and the substitution effect following an increase in the price of one of the two goods.





Key objectives

- Costs and supply
 - Understanding the concept of production function and marginal product (MP)
 - Understanding the nature of different cost types and cost functions
 - Understanding the concept of returns to scale
 - Understanding how costs and supply are related
 - Understanding the distinction between short and long term in economics



Key objectives

- Understanding the efficiency of allocation
 - Consumer surplus
 - Producer surplus
 - Change in surpluses





Useful videos

- https://www.youtube.com/watch?v=z6_ZOcxRU6M
- https://www.youtube.com/watch?v=7qozlj_xoo
- <https://www.youtube.com/watch?v=w-YGhSLcHKg>





Question 1 (Problems and applications)

- Manton Bakery is a company that bakes bread. Here is the relationship between the number of workers and the output in a given day.





Workers	Output	Marginal product	Total costs	ATC	MC
0	0				
1	20				
2	50				
3	90				
4	120				
5	140				
6	150				
7	155				





Question 1 (Problems and applications)

- a) Fill in the column of marginal product. What pattern do you see? How might you explain it?





Workers	Output	Marginal product	Total costs	ATC	MC
0	0				
1	20	20			
2	50	30			
3	90	40			
4	120	30			
5	140	20			
6	150	10			
7	155	5			





Question 1 (Problems and applications)

- a) Fill in the column of marginal product. What pattern do you see? How might you explain it?

It has to do with capacity limits. By increasing labor only, the available equipment remains the same. Initially, more workers can make use of more equipment, but after a while they will be forced to wait until an oven is free.





Question 1 (Problems and applications)

b. A skilled baker cost €100 a day, and the firm has fixed costs of €200. Use this information to fill in the column for total costs.

$$TC = FC + VC = 200 + 100L$$



Workers	Output	Marginal product	Total costs	ATC	MC
0	0	NA	200		
1	20	20	300		
2	50	30	400		
3	90	40	500		
4	120	30	600		
5	140	20	700		
6	150	10	800		
7	155	5	900		



Question 1 (Problems and applications)

- c. Fill in the column for average total costs (ATC).
What pattern do you see?
- d. Now fill in the column for marginal cost! What
pattern do you see?





Workers	Output	Marginal product	Total costs	ATC	MC
0	0	NA	200	$\rightarrow \infty$	NA
1	20	20	300	15	$100/20=5$
2	50	30	400	8	$100/30=$ $=3.33$
3	90	40	500	$500/90=$ $=5.56$	$100/40=2.5$
4	120	30	600	5	$100/30=3.3$ 3
5	140	20	700	5	$100/20=5$
6	150	10	800	$800/150=$ $=5.33$	$100/10=10$
7	155	5	900	$900/155=$ $=5.81$	$100/5=20$



Question 1 (Problems and applications)

c. Fill in the column for average total costs (ATC).
What pattern do you see?

ATC initially decreases then it starts to increase again.

d. Now fill in the column for marginal cost! What
pattern do you see?

Initially it decreases then it starts to increase again.
When MC starts to rise again, ATC also begins to
increase.





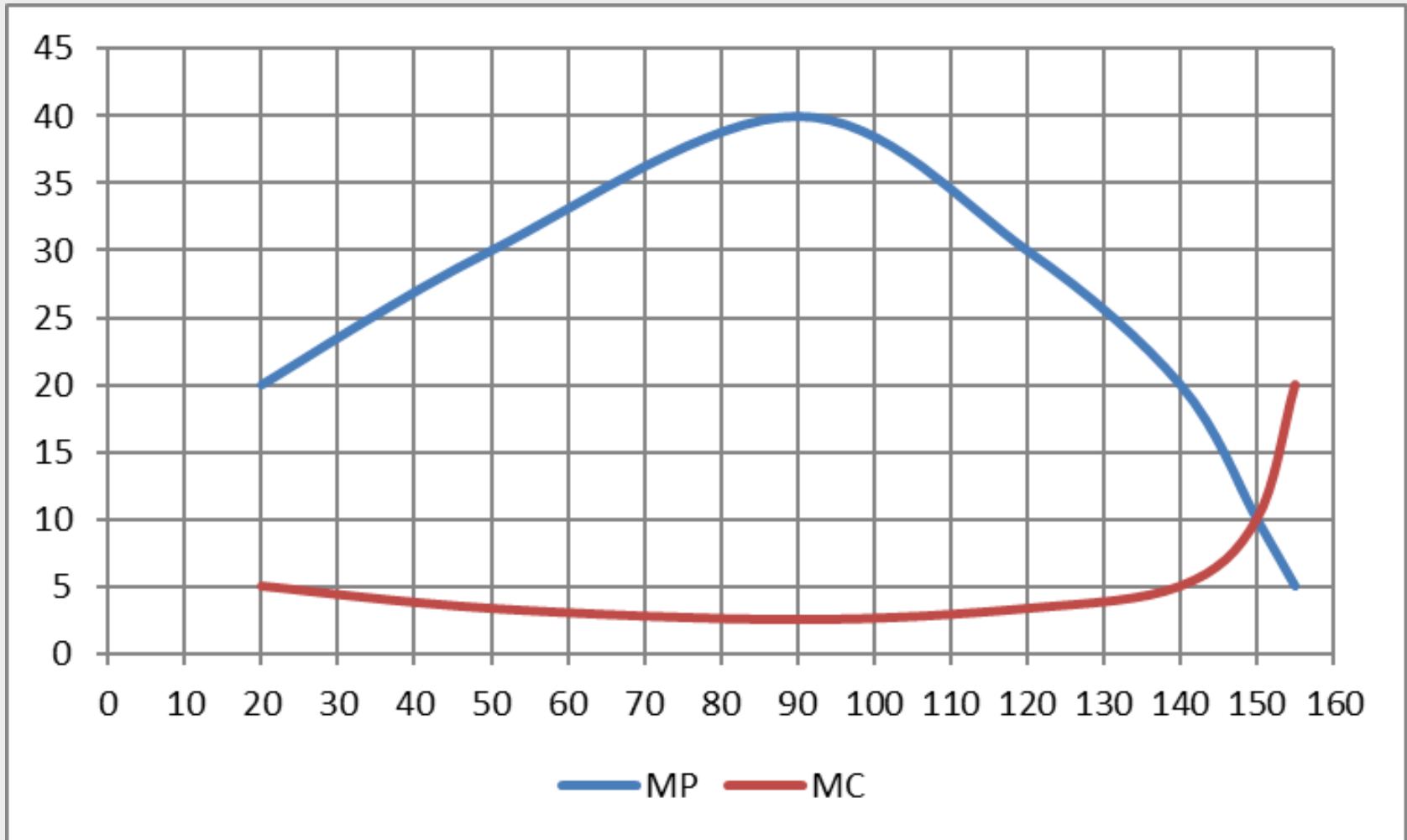
Question 1 (Problems and applications)

- e. Compare the column for MP and the column for MC. Explain the relationship!
- f. Compare the column for average total cost and the column for marginal cost. Explain the relationship.





Question 1 (Problems and applications)





Question 1 (Problems and applications)

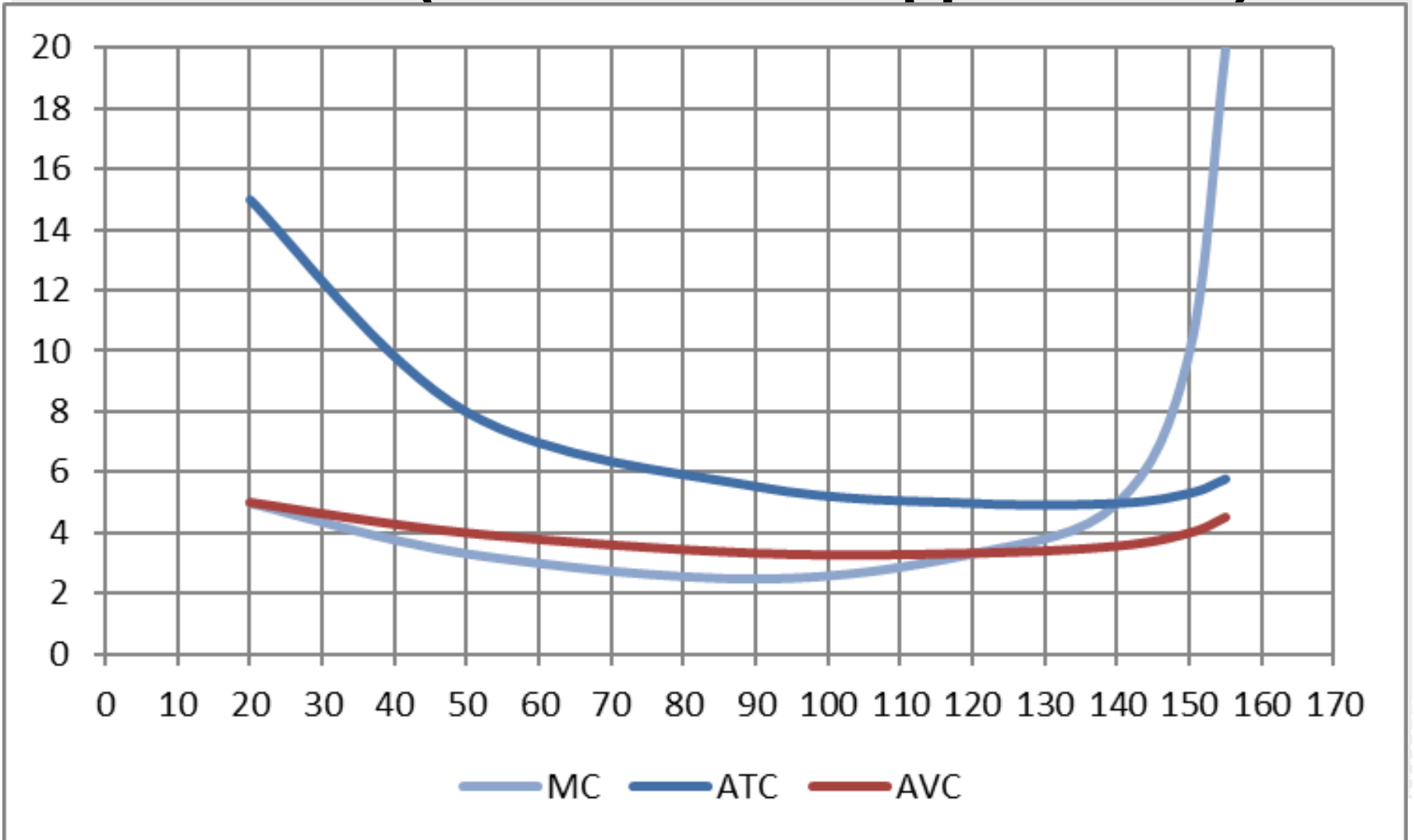
e. Compare the column for MP and the column for MC. Explain the relationship!

The MP decreases because of the limits of the capacity of the bakery. For example, with few workers, there will still be unused ovens. Hence MP increases. With many workers, they need to wait for a free oven, hence the MP should start to decrease. MC will reflect the same capacity limits from the cost perspectives.

The maximum of MP and the minimum of MC is at the same output.



Question 1 (Problems and applications)





Question 1 (Problems and applications)

f. Compare the column for average total cost and the column for marginal cost. Explain the relationship.

When marginal cost is less than average total cost, average total cost is falling; the cost of the last unit produced pulls the average down. When marginal cost is greater than average total cost, average total cost is rising; the cost of the last unit produced pushes the average up. The MC curve intersects the ATC curve at the latter's minimum.

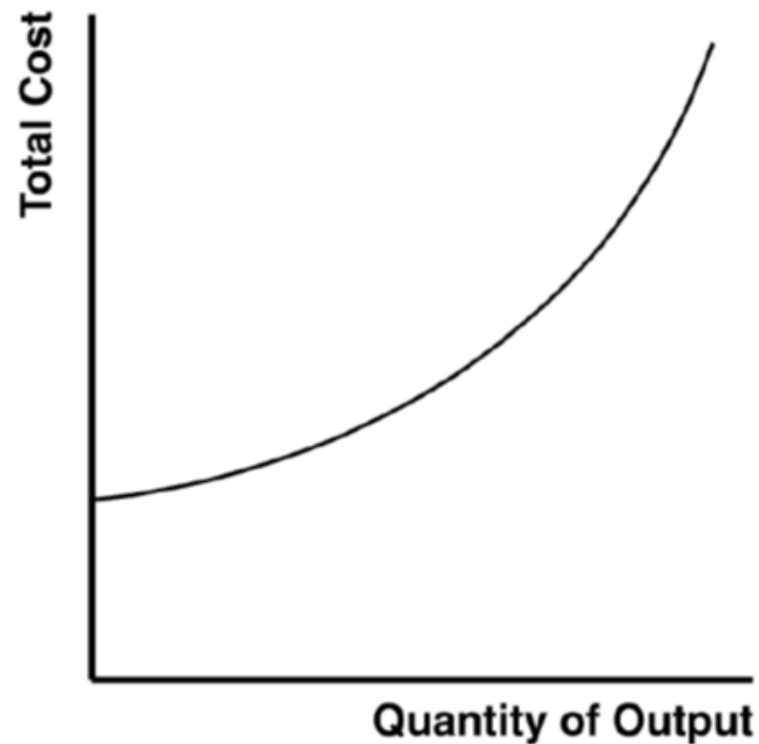
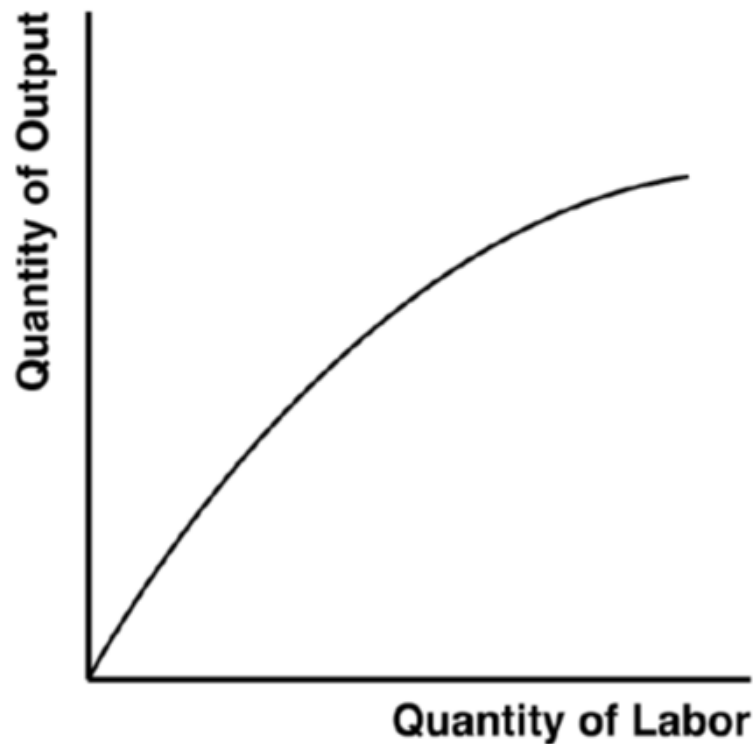


Question 2 (Q for Review number 2, p. 166)

- Draw a production function that exhibits diminishing marginal product of labor. Draw the associated total cost curve. (In both cases, be sure to label the axes.) Explain the shapes of the two curves.



Question 2 (Q for Review number 2, p. 166)





Question 2 (Q for Review number 2, p. 166)

- Here we assume that we are already at full capacity, so we are above the increasing MP and decreasing MC.
- The production function must exhibit decreasing marginal product, so it must have a decreasing slope in Q .
- The total cost curve must exhibit increasing marginal cost, hence its slope should increase in Q .

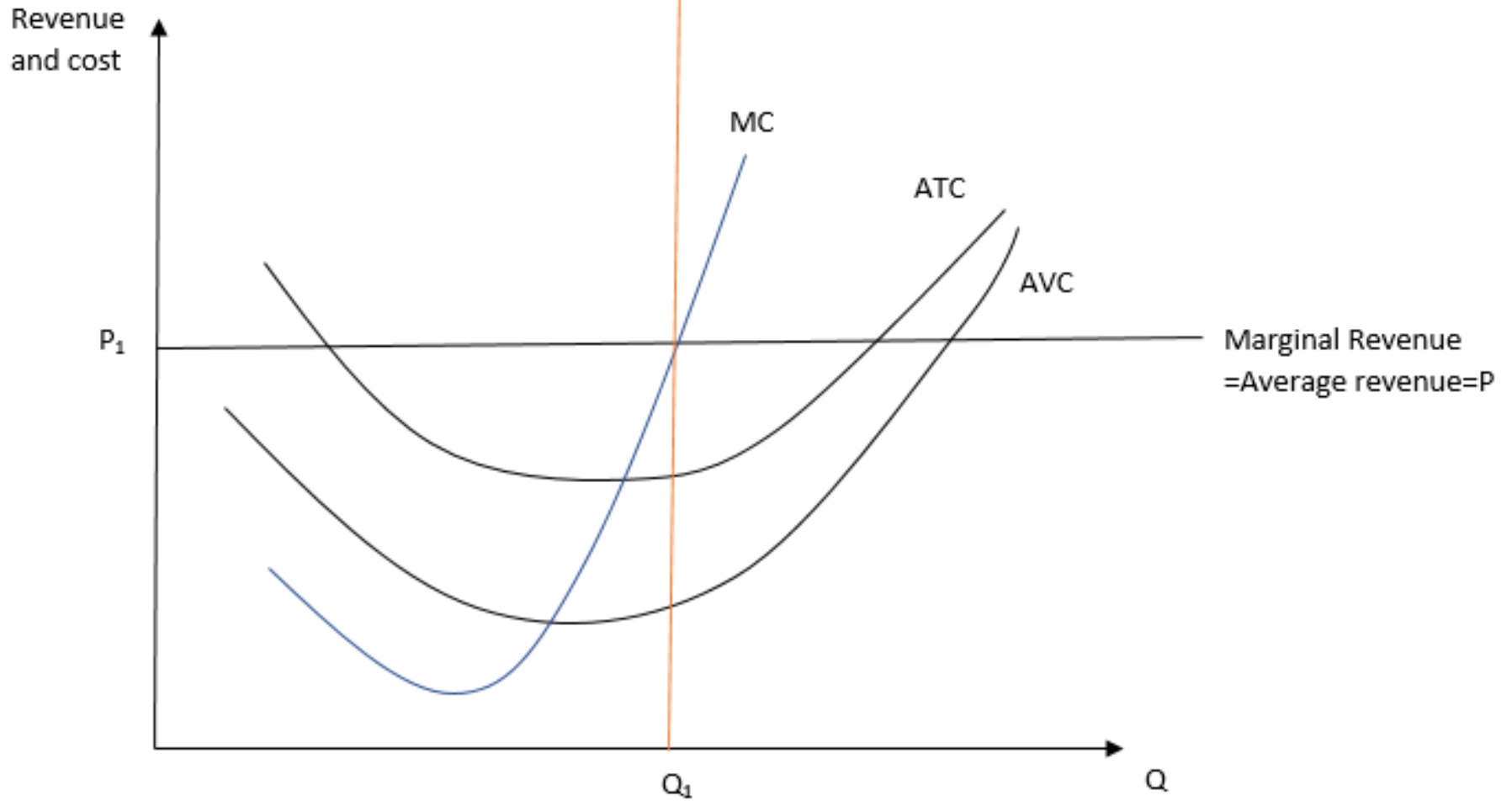
Question 4

- Draw the cost curves of a typical firm. For a given price, explain how the firm chooses the level of output that maximizes the profit.

$$\pi = TR - TC$$

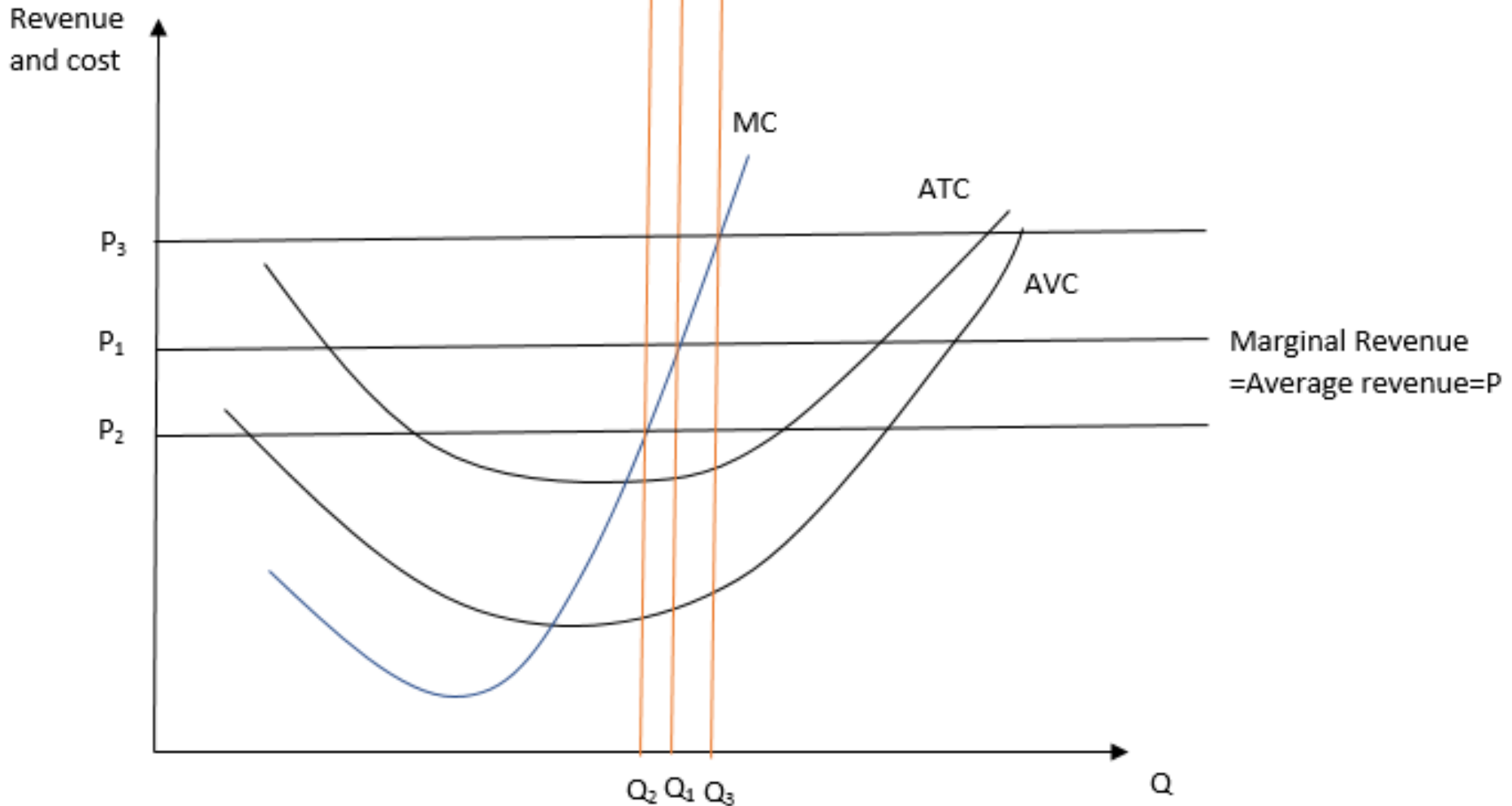
$$\frac{\Delta \pi}{\Delta Q} = \frac{\Delta TR}{\Delta Q} - \frac{\Delta TC}{\Delta Q} = MR - MC$$

$$\frac{\Delta \pi}{\Delta Q} = 0 \rightarrow MR = MC \quad \text{Profit maximum}$$





The supply curve of the competitive firm is its MC curve, if $P > AVC$ (short run) or $P > ATC$ (longrun)





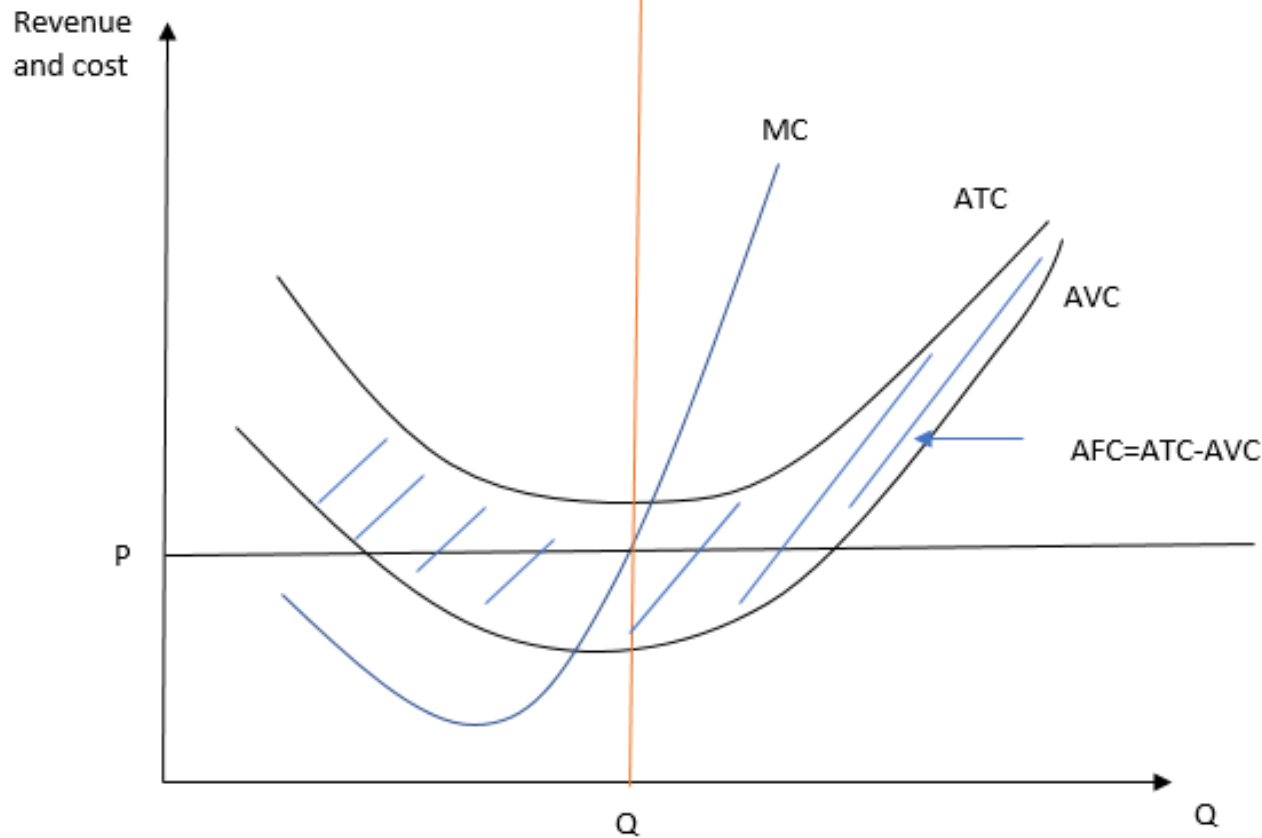
Question 5

- Draw the marginal cost and average total cost curves for a typical firm. Explain why the curves have the shapes they do and why they cross where they do.
- This is already explained in Question 1.

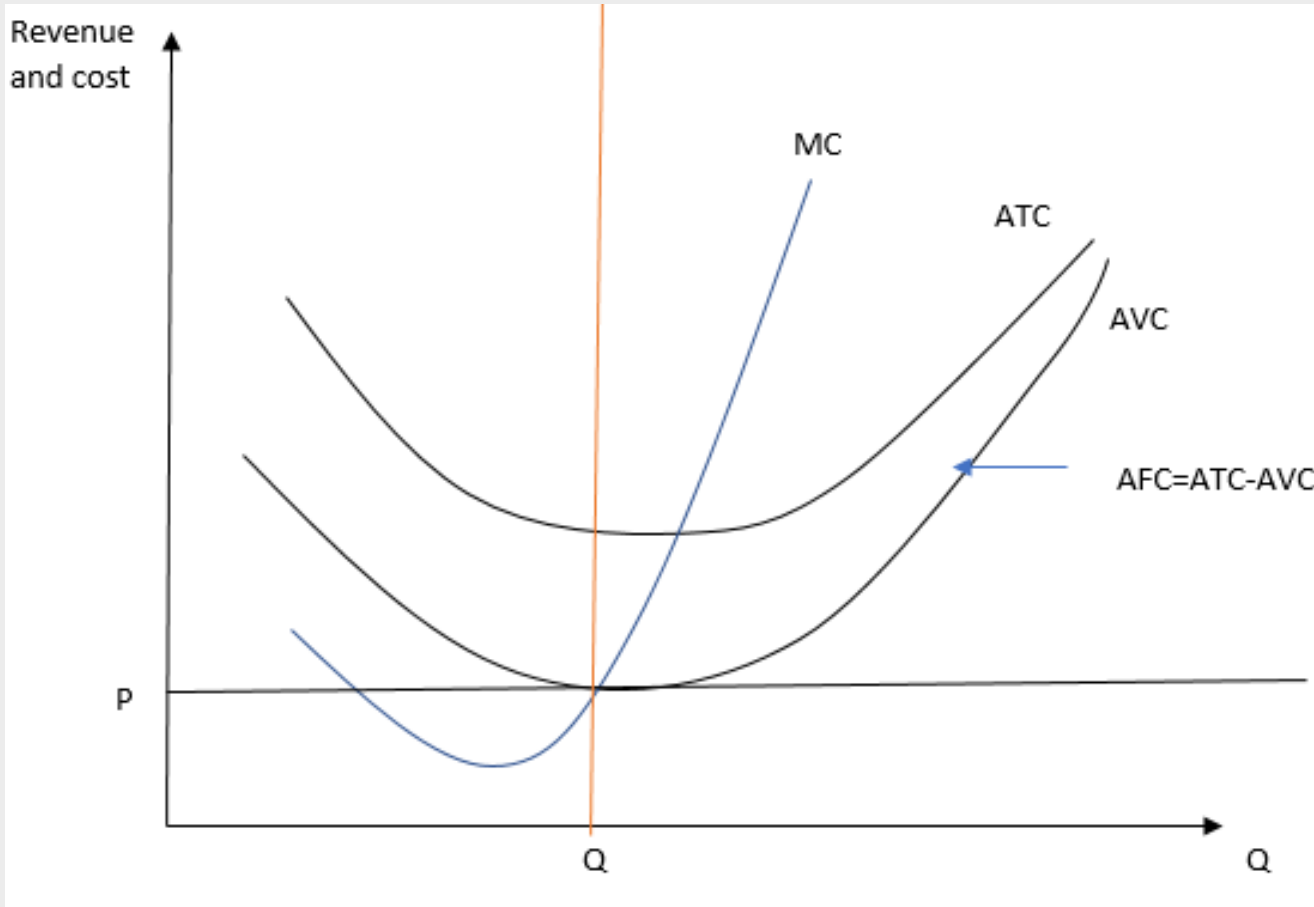


Question 6 and 7

- Under what condition will a firm shut down temporarily. When will it exit the market?
- A firm will shut down temporarily if the revenue it would get from producing is less than the total variable costs of production. This occurs if price is less than average variable cost. $P=MR < AVC$
- A firm will exit the market in the long-run if the revenue it would get if it stayed in business is less than the total costs. This occurs if price is less than average total cost. $P=MR < ATC$

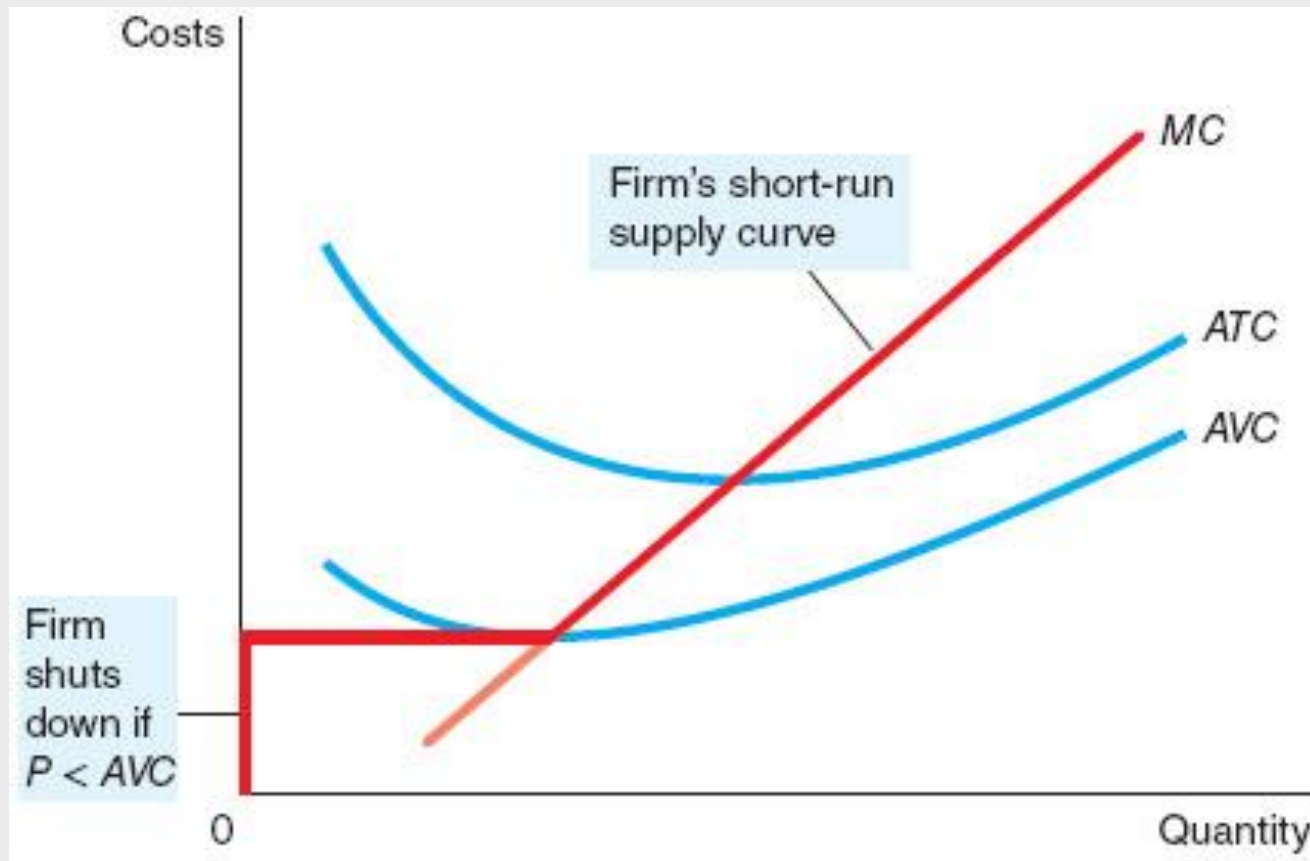


This is the short-run decision: When the price is above AVC and below ATC, we make a loss. Yet, we still make enough money to pay for the variable costs and part of the fixed costs. If we stopped producing we would lose all the fixed costs. Hence, we would be making more loss if we stopped production, while still remaining in the market.



When price is below AVC , we cannot pay even our variable costs, so our total loss is surely higher than the fixed costs, that we would lose by not producing at all. We are going to stop producing even in the short-run.

Short-run supply curve

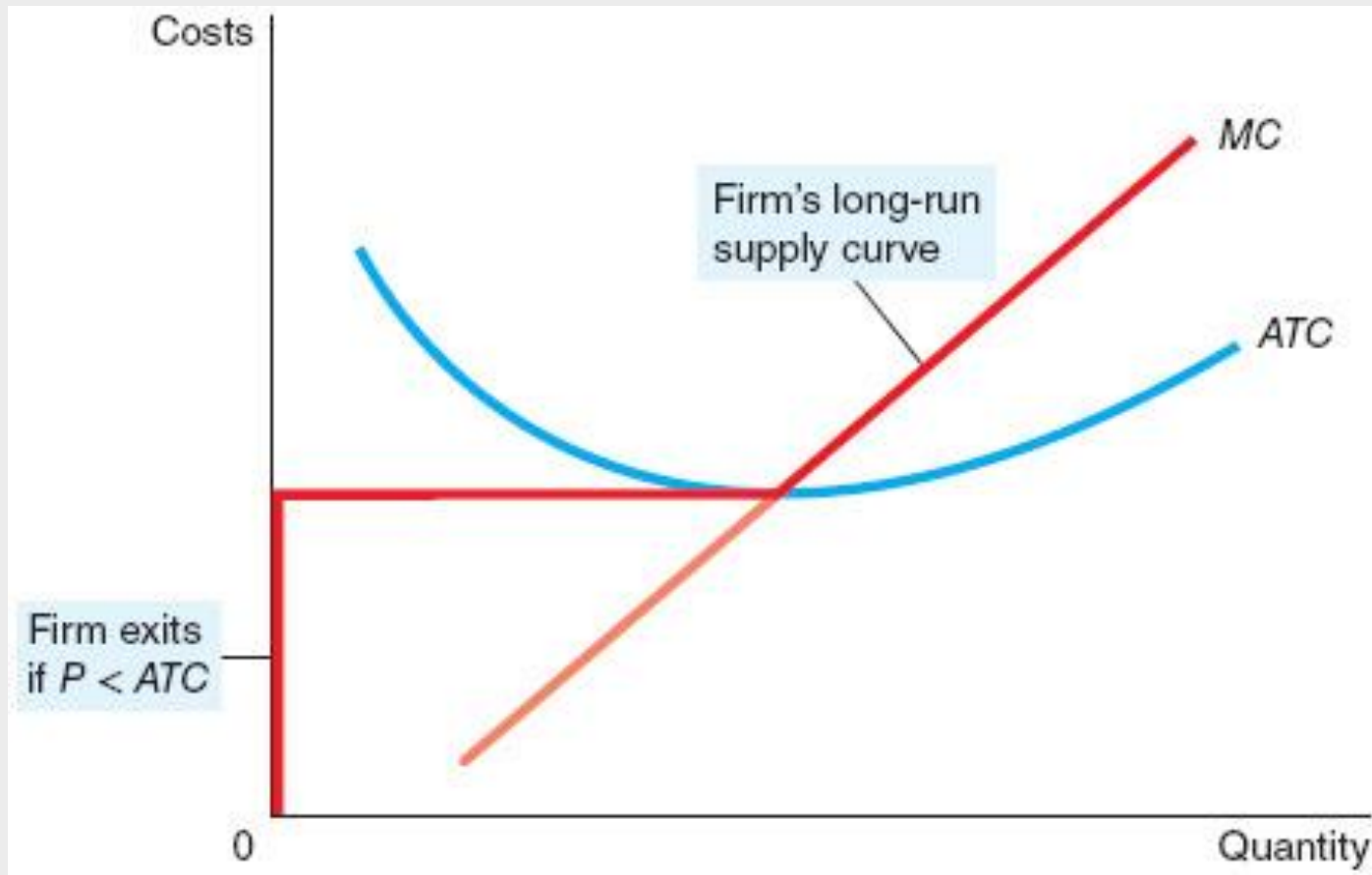




Question 6 and 7

- In the long-run you do not want to make loss, so if the price gets below the average cost, you just exit the market and get rid of both fixed and variable costs.
- If P is above the ATC , then you can make a profit and new producers will enter the market, pushing the price down.
- Hence in the long run P must equal ATC . Zero profit condition.

Long-run supply curve





Chapter 6 Q.8, Q9 and Q10

- Does the firm's price equal marginal costs and the minimum of the ATC in the short-run, in the long-run, or both?
- Explain the difference between increasing, constant and decreasing returns to scale. It is in the book: p145.
- Are market supply curves typically more elastic in the short-run or in the long-run?



Chapter 6 Q.8

- Does the firm's price equal marginal costs and the minimum of the ATC in the short-run, in the long-run, or both?
- $MC=MR=P$ is always true for a profit maximizing firm.
- When ATC is at minimum, $MC=ATC$. This can be an optimal choice, if $MR=ATC$. In such case the profit is zero. In the short-run it is possible to have a positive or negative profit, but then firms enter or exit the market until, $MR=MC=\text{lowest ATC}$.



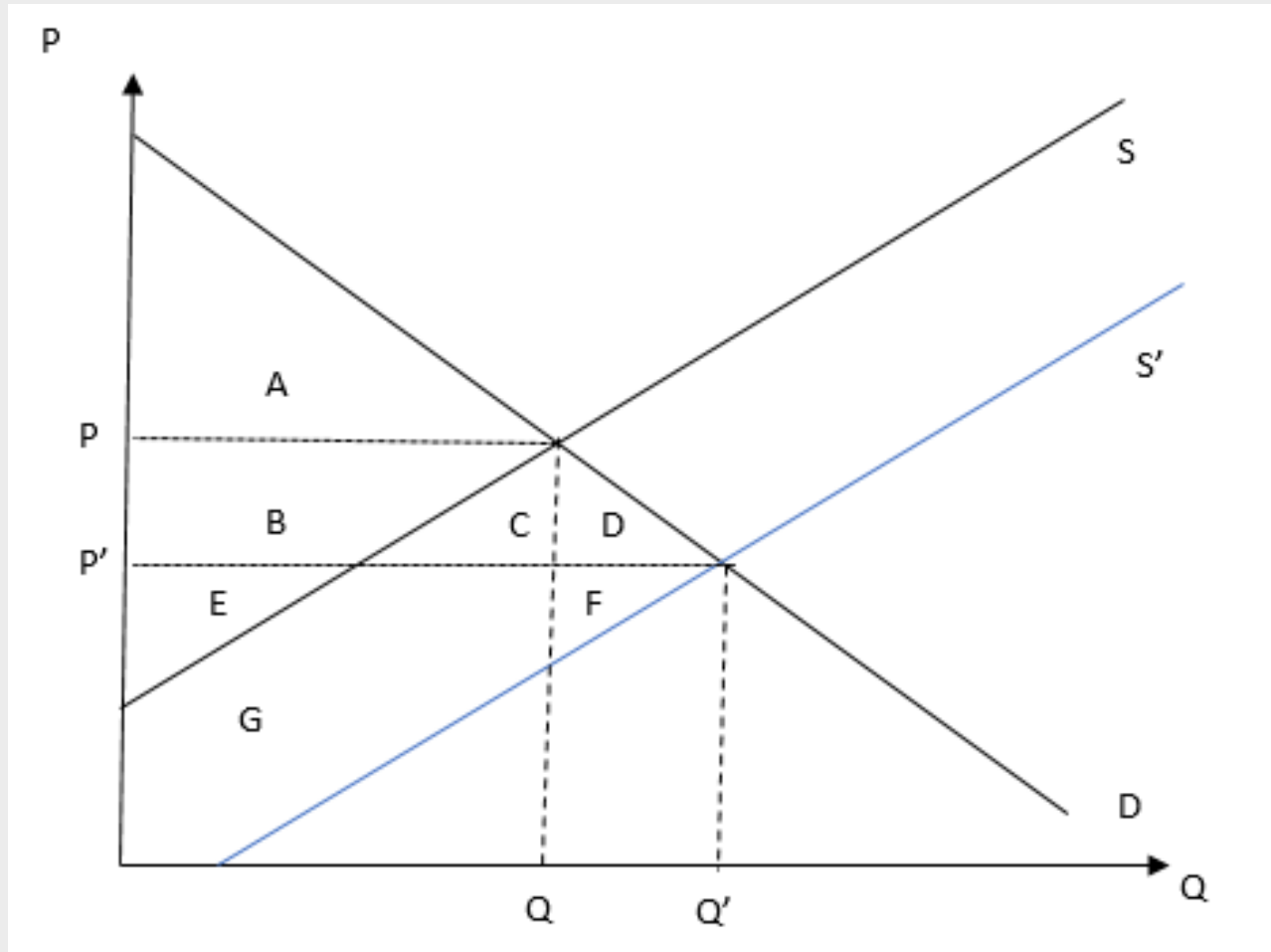
Chapter 6 Q.10

- Are market supply curves typically more elastic in the short-run or in the long-run?
- Market supply curves are typically more elastic in the long run than in the short run. In a competitive market, since entry or exit occurs until price equals the minimum of average total cost, the supply curve is perfectly elastic in the long run. But entering or exiting the market takes time, so in the short run you may have less than infinite supply elasticity.



Question 2-Question 8 from problems and applications on page 186

- The cost of producing smart phones has fallen over the past few years. Let's consider some implications of this fact.
 - Use a supply-and-demand diagram to show the effect of falling production costs on the price and demand of smart phones sold.
 - Show what happens to consumer and producer surplus.
 - Suppose that the supply of smart phones is elastic. Who benefits more from falling production costs?





Question 2-Question 8 from problems and applications on page 186

- Before the reduction in costs, consumer surplus was A , the producer surplus was $B+E$.
- The reduction in costs shifts the supply curve to the right.
- The consumer surplus grows to $A+B+C+D$. The new producer surplus is $E+G+F$. IF $B < G+F$, the producer also gained utility.



Question 2-Question 8 from problems and applications on page 186

Suppose that the supply of smart phones is elastic. Who benefits more from falling production costs?

The consumers will benefit more. If the supply is perfectly elastic, then the producer will have no surplus at all.



