

NCERT SOLUTIONS

CLASS - 12th



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Class : 12th

Subject : Economics

Chapter : 3

Chapter Name : Production and Costs

Q1 Explain the concept of production function?

Answer. Production function exhibits a functional relation between physical input and physical output.

Algebraically production function can be written as $Q=f(L, K)$

L= Labour used in production,

K= Capital used in production

Q stands for output produced.

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Q2 What is the total product of an input?

Answer. Total product refers to the total amount of physical output that is produced with the use of some physical input say, labour and capital during a particular period of time.

Total product = Total output from the given input.

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Q3 What is the average product of an input?

Answer. The average product is the ratio of total product to the variable factors used in the production.

Average product = Total product / No. of variable units used

It can also be defined as the output per unit of variable factor.

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Q4 What is the marginal product of an input?

Answer. Marginal product is the change in the total product due to use of additional variable factors used in production. Algebraically, $MP = TP_{n-1} - TP_n$.

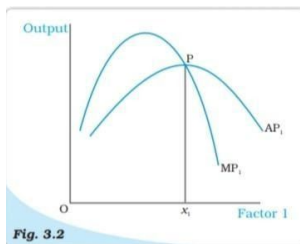


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Q5 Explain the relationship between the marginal product and the total product of an input.

Answer. The relationship between the marginal product and total product is-

- i) Initially total product increases at an increasing rate for which marginal product increases.
- ii) Then the total product increases at a decreasing rate for which marginal product decreases.
- iii) Total product attains maximum point for which marginal product is zero.
- iv) Finally total product decreases for which marginal product becomes negative.

Land	Labour	TP	MP
2	0	0	-
2	1	12	12
2	2	29	14
2	3	46	17
2	4	62	16
2	5	75	13
2	6	84	9
2	7	88	4
2	8	90	2
2	9	90	0
2	10	88	-2
2	11	84	-4
2	12	78	-6

In MP column, 12, 14, 17 belongs to IRF that is increasing returns to factor ; 16, 13, 9, 4, 2, 0 belongs to DRF that is decreasing returns to factor and -2, -4, -6 belongs to NRF negative returns to factor.

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Q6 Explain the concept of short run and long run?

Answer. Short run refers to a time period in which there exist some fixed factors of production and some variable factors of production. Thus we can say that there will be change in the level of production during the short run.

Long run refers to a time period in which all the factors are variable and thus can be changed. Due to this, there will be a change in the scale of production.

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Q7 What is Law of Diminishing Marginal Product?

Answer. According to the Law of Diminishing Marginal Product, when total product increases at a decreasing rate with employment of more variable factors combined with the fixed factors of production then marginal product decreases.

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Q8 What is the Law of Variable Proportion?

Answer. Law of Variable Proportion is a short run analysis. According to the law, keeping at least one factor of production fixed, by changing the variable factor of production, the ratio of fixed and variable factor changes for which total product and marginal product changes in the following ways-

- i) Initially Total product increases at an increasing rate for which the marginal product increases. (Increasing returns to factor)
- ii) Then the Total product increases at a decreasing rate, for which marginal product decreases. (Diminishing returns to factor)
- iii) Finally Total product attains maximum point leading to marginal product Zero.

iv) Finally Total product decreases for which marginal product becomes negative. (Negative returns to factor)

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Q9 When does a production function satisfy constant returns to scale?

Answer. Constant returns to scale is the second stage in the law of returns to scale. It takes place in the long run when the proportionate increase in all the factors of production leads to an increase in the output in the same proportion. For example, if the proportionate increase in the factors of production by 15% leads to an increase in output by 15%, then it is termed as the constant returns to scale.

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Q10 When does a production function satisfies increasing returns to scale?

Answer. Increasing returns to scale is the stage when the proportion increase in all the factors of production leads to a greater increase in the output. It takes place in the long run when the firm enjoys economies of scale for large scale production.

For example, if the proportionate increase in the factors by 10% leads to a 15% increase in the output, then it is situation of increasing returns to scale.

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Q11 When does a production function satisfy decreasing returns to scale?

Answer. Diminishing returns to scale is the stage when the proportion increase in all the factors of production leads to a lesser increase in the output. It takes place in the long run when the firm enjoys diseconomies of scale for large scale production.

For example, if the proportionate increase in the factors by 15% leads to a 10% increase in the output, then it is situation of increasing returns to scale.

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Q12 Briefly explain the concept of cost function?

Answer. Cost function exhibits the functional relation between expenditure incurred by the producer and the output produced.

Algebraically,

$$c=f(Q),$$

where c= cost of production and Q= output produced.

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Q13 What are the total fixed cost, total variable cost and total cost of firm? How are they related?

Answer. Total fixed cost is the expenditure incurred by the producer for hiring the fixed factors of production. It remains constant throughout the production and is not dependent on the output produced. It exists even when there is no production.

Total Variable cost refers to the expenditure incurred by the producer for hiring the variable factor of production.

Total cost refers to the sum total of the total fixed cost and total variable cost.

Total cost= Total fixed cost + Total variable cost

TC= TFC + TVC

Units	TFC	TVC	TC
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0	20	-	20
1	20	20	40
2	20	22	42
3	20	27	47
4	20	30	50
5	20	22	53

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Q14 What are average fixed cost, average variable cost and average cost of a firm? How are they related?

Answer.

1. Average fixed cost is the ratio of total fixed cost to output produced.
2. Average variable cost is the ratio of total variable cost to the output produced
3. Average cost is the ratio of total cost to output produced.

$$TC = TFC + TVC$$

Now, dividing the equation with Q, i.e. output produced.

$$\frac{TC}{Q} = \frac{TFC}{Q} + \frac{TVC}{Q}$$

$$AC = AFC + AVC$$

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Q15 Can there be some fixed cost in the long run? If not, Why?

Answer. No. In the long run only variable factors of production are employed, no fixed factor is used. Thus only variable cost exist and not fixed cost.

Fixed costs are those costs which are incurred on the fixed factors of production.

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Q16 What does the average fixed cost look like? Why does it look so?

Answer. Average fixed cost looks like a rectangular hyperbola.

Average fixed cost is the ratio of total fixed cost to output produced. Here, total fixed cost remains constant throughout. So with the increase in the unit of output, denominator of AFC increases whereas, numerator which is TFC remains constant. So value of AFC keeps on falling and it looks like a rectangular hyperbola.

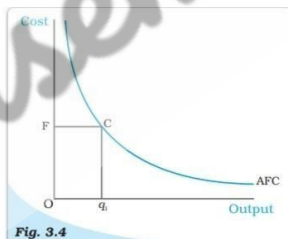


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Q17 What do the short run marginal cost, average variable cost and short run average cost curve looks like?

Answer. Short run marginal cost, average variable cost and short run average cost curve looks like U shaped.

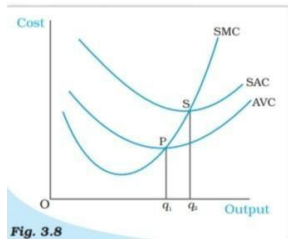


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Q18 Why does the SMC curve cuts the AVC curve at minimum point of AVC curve?

Answer. SMC is equal to AVC at AVC's minimum point. When AVC decreases MC also decreases but MC decreases more than AVC. MC intersects AVC at its minimum point and then both MC and AVC increases but increase in MC is more than increase in AVC. So at point of intersection which is their minimum point of AVC, MC curve cuts AVC curve.

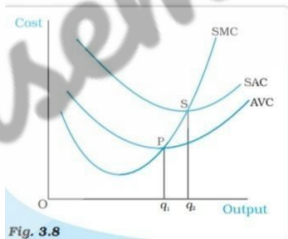


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Q19 At which point does the SMC curve cut the SAC curve? Give reasons in support of your answer?

Answer. SMC(Short run marginal cost) curve cuts SAC(Short run average cost) curve at the minimum point of SAC where both SAC and SMC are equal.

SMC and SAC falls but SMC falls more than SAC. It is evident from the graph that after attaining minimum point SMC starts rising where AC is still falling. So SMC curve intersect SAC curve at its minimum point.

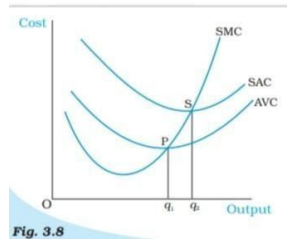


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Q20 Why is the short run marginal cost curve U shaped?

Answer. Marginal cost is derived from TVC .Initially TVC increases at a decreasing rate for which marginal cost decreases .Thereafter, TVC increases at an increasing rate then MC increases. The reason for decrease in MC in the initial stage lies in the Law of Variable Proportion. During the initial stage marginal product increases corresponding to decrease in marginal cost. When marginal product reaches maximum it corresponds to minimum point of Marginal cost. When MP decreases, MC increases. Thus, MC is U shaped.

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Q21 What do the long run marginal cost and average cost curve look like?

Answer. Long run marginal cost and average cost curve is U shaped but flatter than the short run average cost and marginal cost curve.

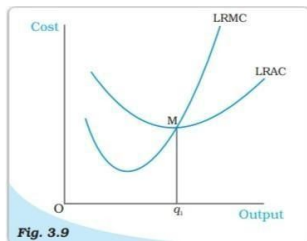


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Q22 The following table gives the total product schedule of labour. Find the corresponding average product and marginal product schedule of labour.

Labour	TPI
0	0
1	15
2	35
3	50
4	40
5	48

Answer.

$$AP = \frac{TP}{L}$$

$$MP = TP_{n-1} - TP_n$$

Labour	TP	AP	MP
0	0	0	-
1	15	15	15
2	35	17.5	20
3	50	16.7	15
4	40	10	-10
5	48	9.6	8

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Q23 The following table gives the average product schedule of labour. Find the total product and marginal product schedule. It is given that the total product is zero at zero level of labour employment.

L	1	2	3	4	5	6
AP	2	3	4	4.25	4	3.5

Answer.

L	AP	TP	MP
1	2	2	2

2	3	6	4
3	4	12	6
4	4.25	17	5
5	4	20	3
6	3.5	21	1

$$TP = AP \times L$$

$$MP = TP_{n-1} - TP_n$$

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Q24 The following table gives the marginal product schedule of labour. It is also given; total product of labour is zero level of employment. Calculate the total, average product schedule of labour.

L	1	2	3	4	5	6
AP	3	5	7	5	3	1

Answer.

L	AP	TP	MP
1	3	3	3
2	5	10	7

3	7	21	11
4	5	20	-1
5	3	15	-5
6	1	6	-9

$$MP = TP_{n-1} - TP_n$$

$$AP = \frac{TP}{Q}$$

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Q25 The following table shows the total cost schedule of a firm. What is the total fixed cost of the firm? Calculate TVC, AFC, AVC, SAC and SMC schedule of firm.

Q	0	1	2	3	4	5	6
TC	10	30	45	55	70	90	120

Answer.

Q	TC	TVC	AFC	AVC	TFC	SAC	SMC
0	10	0	-	-	10	-	-
1	30	20	10	20	10	30	20
2	45	35	5	17.5	10	22.5	15

3	55	45	3.33	15	10	18.3	10
4	70	60	2.5	15	10	17.5	15
5	90	80	2	16	10	18	20
6	120	110	1.7	18.3	10	20	30

$TVC = TC - TFC$

$$AFC = \frac{TFC}{Q}$$

$$AVC = \frac{TVC}{Q}$$

$$SAC = \frac{TC}{Q}$$

$$SMC = TC_{n+1} - TC_{n-1}$$

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Q26 The following table gives the total cost schedule of a firm. It is also given that the average fixed cost at 4 units of output is Rs. 5. Find TVC, TFC, AVC, AFC, SAC and SMC schedules of the given firm for the corresponding values of output.

Q	1	2	3	4	5	6
TC	50	65	75	95	130	185

Answer.

Q	TC	TFC	TVC	AVC	AFC	SAC	SMC
1	50	20	30	30	20	50	30
2	65	20	45	22.5	10	32.5	15
3	75	20	55	18.3	6.67	25	10
4	95	20	75	18.75	5	23.75	20
5	130	20	110	22	4	26	35
6	185	20	165	27.5	3.3	30.8	55

AFC at 4 units is Rs. 5

Therefore,

$$TVC = TC - TFC$$

$$AFC = \frac{TFC}{Q}$$

$$AVC = \frac{TVC}{Q}$$

$$SAC = \frac{TC}{Q}$$

$$SMC = TC_{n+1} - TC_n$$

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Q27 A firm's SMC schedule is shown in following table. The total fixed cost of the firm is Rs. 100. Find the TVC, TC, AVC, and SAC schedule of the firm.

Q	0	1	2	3	4	5	6
SMC	-	500	300	200	300	500	800

Answer.

Q	SMC	TFC	TVC	TC	AVC	SAC
0	0	100	0	100	-	-
1	500	100	500	600	500	600
2	300	100	800	900	400	450
3	200	100	1000	1100	333.33	366.6
4	300	100	1300	1400	325	350
5	500	100	1800	1900	360	380
6	800	100	2600	2700	433.3	450

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Q28 Let the production function of firm be $Q = 5L^{1/2} \times K^{1/2}$. Find out the maximum possible output that the firm can produce with 100 units of L and 100 units of K.

Answer. $Q = 5L^{1/2} \times K^{1/2}$

$$Q = 5 \times 100^{1/2} \times 100^{1/2}$$

$$Q = 5 \times 10 \times 10 = 500 \text{units}$$

Maximum possible output that the firm can produce with 100 units of L and 100 units of K is 500.

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Q29 Let the production function of a firm be $Q=2L^2 \times K^2$. Find out the maximum possible output that the firm can produce with 5 units of L and 2 units of K. What is the maximum possible output that firm can produce with zero unit of L and 10 units of K?

Answer. i) When L=5 and K=2

$$Q=2L^2 \times K^2$$

$$Q = 2 \times 5^2 \times 2^2 = 2 \times 25 \times 4 = 200 \text{units}$$

ii) When L=0 and K=10

$$Q=2L^2 \times K^2$$

$$(x_2, y_2)$$

Maximum possible output that the firm can produce with zero unit of L and 10 units of K is 200

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Q30 Find the maximum possible output for a firm with zero unit of land 10 units of K when its production function is $Q=5L+2K$.

Answer. Given :

$$Q=5L+2K$$

L=0 units

K= 10 units

Therefore, $Q= 5L+2K$

$$Q = 5 \times 0 + 2 \times 10 = 20 \text{ units}$$

Hence, Maximum output is 20 units.

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