

NCERT SOLUTIONS

CLASS - 12th



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Class : 12th

Subject : Economics

Chapter : 4

Chapter Name : The Theory of the Firm under Perfect Competition

Q1 What are the characteristics of a perfectly competitive market?

Answer. Perfectly competitive market refers to the market which consist of large number of buyers and sellers selling a homogeneous product.

Characteristics of a perfectly competitive market are-

- i) No of buyers and sellers: There exists a large number of buyers and sellers in the market.
- ii) Nature of product: The product bought and sold is absolutely homogeneous in nature.
- iii) Free entry and exit: There exists free entry and exit of the sellers in the market.
- iv) Price: The price of commodity is pre-determined in the market. Neither the buyer nor the seller can influence the price. Hence it is a price taker firm.
- v) Profit: The producer of this type of market earn only normal profit. The firm under this type of market earn only normal profit.
- vii) Knowledge of the market: Both buyers and sellers have perfect knowledge about the price and quantity of product bought and sold in the market.

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Q2 How is the total revenue of the firm, market price and the quantity sold by the firm related to each other?

Answer. Total revenue is the income generated from sales of the product at a particular price in the market during a particular period of time. Thus revenue is the product of price of the commodity and output sold.

Total Revenue = Price of commodity \times Output sold

$$TR = P \times Q$$

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Q3 What is the price line?

Answer. For a perfectly competitive market, it is a horizontal line that represents the market price for the firm. Here, in the graph the price line and demand curve are same. Thus $AR = D$ is the price line.

Price line is the line that represents the market price of the goods of the firm.

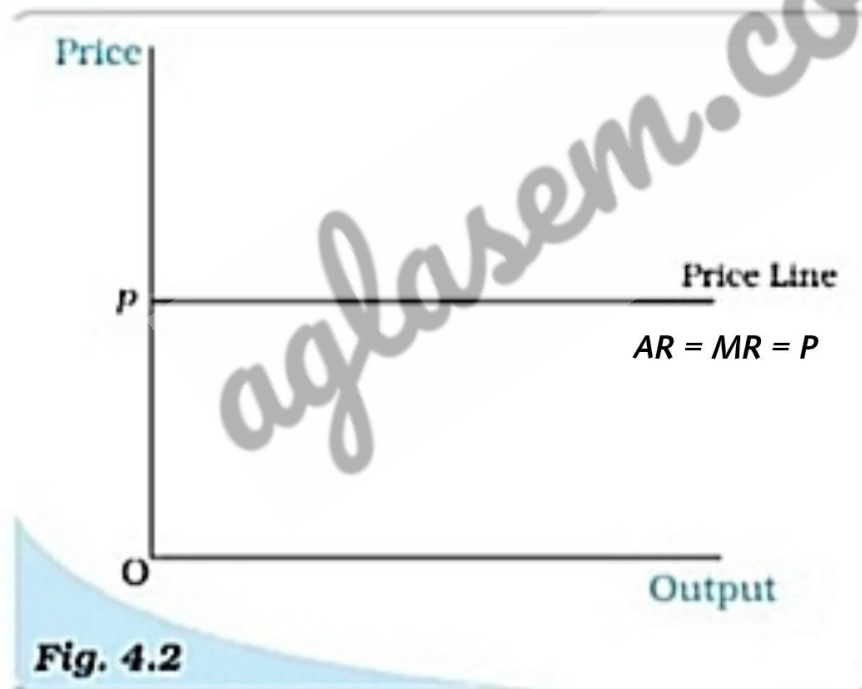


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Q4 Why is the total revenue curve of a price taking firm an upward sloping straight line? Why does curve pass through the origin?

Answer. Total revenue is the income generated from sales of the product at particular price in the market during a particular period of time. It is the product of market price and output sold.

Consider the table below:

Untis of Q	P	$TR = P \times Q$	AR	MR
1	10	10	10	10
2	10	20	10	10
3	10	30	10	10
4	10	40	10	10
5	10	50	10	10

- Here, we note that the units sold goes on increasing, price remaining constant for a perfectly competitive firm.
- Thus AR and MR which is equal to price remains the same.
- With price remaining constant total revenue goes on increasing and is upward sloping straight line because the slope of the cuve remains constant.
- When units sold is zero, total revenue is also zero thus it passes form origin.

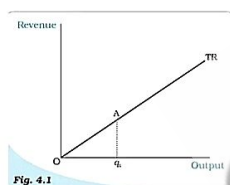


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Q5 What is the relation between market price and average revenue of a price taking firm?

Answer. Average revenue is the ratio of total revenue to quantity sold i.e.

$$AR = \frac{TR}{Q} = \frac{P \times Q}{Q} = P$$

Thus, AR=P; Average revenue is equal to Market Price.

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Q6 What is the relation between market price and marginal revenue of a price taking firm.

Answer. Marginal revenue is the change in total revenue due to additional unit of output sold.

$$MR = TR_{n+1} - TR_n$$

For a price taking firm market price is equal to marginal revenue because firm can sell more unit of goods at same price. As a result, marginal revenue is equal to average revenue or price.

Units Q	P	TR	AR	MR
1	10	10	10	10
2	10	20	10	10
3	10	30	10	10
4	10	40	10	10
5	10	50	10	10

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Q7 What conditions must hold if a profit maximum firm produces positive output in a competitive market?

Answer. There are two conditions that profit maximizing firm should hold if it produces a positive output in a competitive market -

- i) Marginal Revenue must be equal to Marginal Cost i.e. MR=MC
- ii) Marginal cost curve intersects MR curve from below.

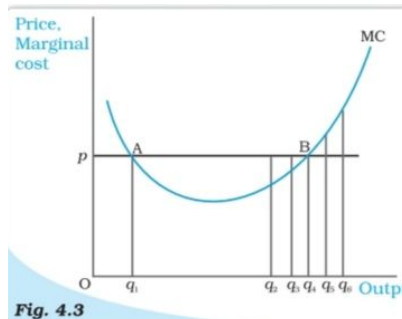


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- According to the graph, first condition i.e. equality of MR and MC is evident at point A and B. Since two points cannot be equilibrium points. It is important that the second condition is also fulfilled.
- Beyond point A in graph, it is evident that $MR > MC$ indicating profit for producer. The producer earns profit till point B.
- Again at point B, $MR = MC$ and there is no profit no loss situation.
- Beyond B, if producer produces, MC becomes more than MR. Thus producer will incur loss.
- So he will stop at point B where both conditions are fulfilled i.e. $MR = MC$ and MC curve intersects MR curve from below.

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Q8 Can there be positive level of output that a profit maximizing firm produces in a competitive market in which market price is not equal to marginal cost. Give an explanation.

Answer. No, a firm cannot produce at a point where market price is not equal to marginal cost because it is a necessary condition for a perfectly competitive firm that MR should be equal to MC in order to be in equilibrium.

If a firm produces at a situation where MR is more than MC , he will earn super profits and hence will continue production. Gradually MC will go on increasing and point will reach where MR becomes equal to MC.

If firm further continues to produce, MC will be more than MR and firm will incur loss. So firm will stop at the point where MC was equal to MR.

Thus we see that a profit maximizing firm can not produce at point where MC is not equal to MR.

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Q9 Will a profit maximizing firm in a competitive market ever produces a positive level of output in the range where the marginal cost is falling? Give an explanation.

Answer. No, a profit maximizing firm in a competitive market will never produce when marginal cost is falling because in this situation the second order condition i.e. MR curve should intersect MC curve from below is not fulfilled. So, profit maximizing firm will produce at that quantity of output at which MC is rising and intersecting MR curve.

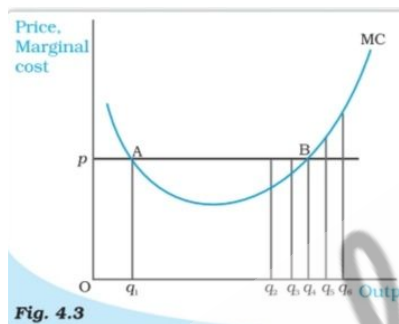


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Let us understand this with the above graph:

At point A, $MR = MC$ but MC is falling and let say quantity produced at point A is q_1 . Now as producer produces more than q_1 level of output MR becomes greater than MC which motivates to produce more as profit is maximized by increasing the level of output.

Now the producer reaches B level of output which is the equilibrium point. The producer won't produce further as it will result in MC greater than MR incurring loss. Hence at this point, profit is maximized where MC is rising.

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Q10 Will a profit maximizing firm in a competitive market produce a positive level of output in the short run if market price is less than the minimum of AVC? Give an explanation.

Answer. No, a competitive market will not produce a positive level of output in the short run if market price is less than the minimum of AVC. This is because the point where market price is equal to the minimum point of AVC indicates shutdown point for the firm and a firm will never operate at a price less than minimum AVC.

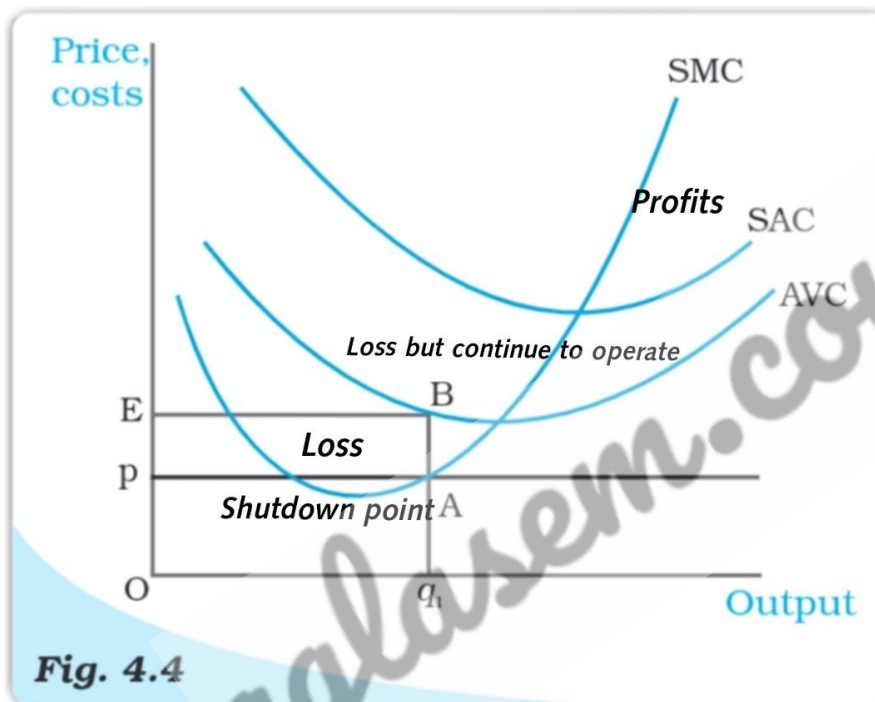


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At price P and quantity q_1 ,

$TR = OP \times Oq_1$, which is represented by the $OPAq_1$

$TC = AVC \times Oq_1 = OE \times Oq_1$, which is represented by the Oq_1BE

Profit = $TR - TC = OPAq_1 - Oq_1BE$

As we can see

$TC > TR$, so there is loss, which is represented by $PABE$.

Thus the firm shall stop production whenever $Price \text{ or } AR < AVC$

In short run, at profit maximising level, $AC > AVC$

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Q11. Will a profit maximizing firm in a competitive market produce a positive level of output in the long run if market price is less than the minimum of AC? Give an explanation.

Answer. No, firm in a competitive market will not produce a positive level of output in the long run if market price is less than the minimum of AC because in such market there is free entry and exit of firms and thus each firm earns normal profit. So firm incurring loss will stop production and exit the market.

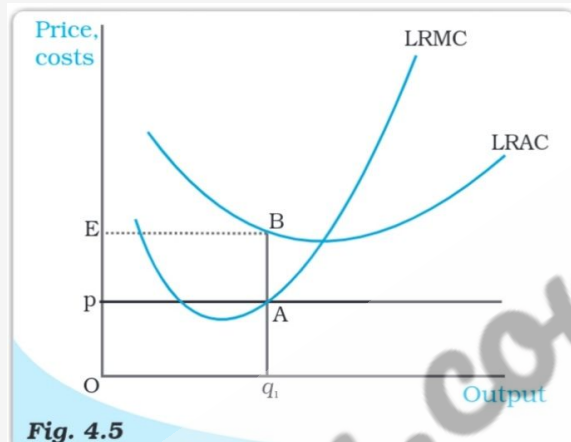


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The region PABE in the graph depicts the loss the firm will incur on producing goods and services if price falls below minimum average cost in the long run.

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Q12 What is the supply curve of firm in short run?

Answer. A firm's short run supply curve is the rising part of SMC curve from and above the minimum AVC together with zero output for all prices strictly less than minimum AVC.

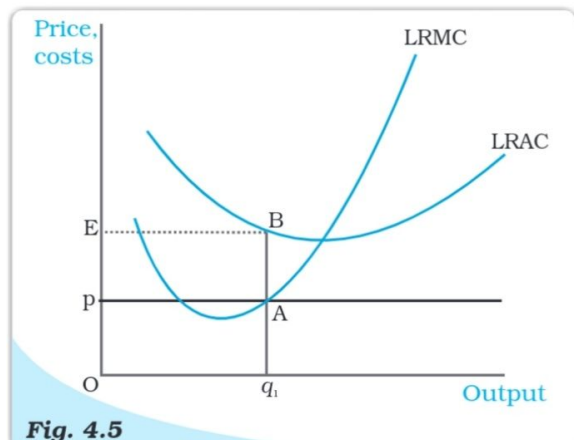


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Q13 What is the supply curve of the firm in long run?

Answer. A firm's long run supply curve is the rising part of the LRMC curve from and above the minimum LRAC together with zero output for all prices less than minimum LRAC.

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Q14 How does technological progress affects the supply curve of a firm?

Answer. Technological progress shifts the supply curve of a firm in the rightward direction. Technological progress will lower the firms marginal cost at any level of output and MC curve will shift rightward. As supply curve is a segment of MC curve, supply curve also shifts to the right.

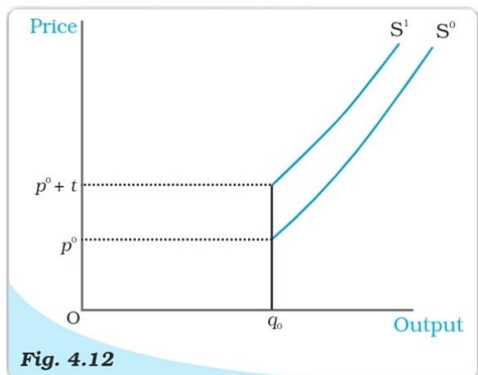


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Here, let S_1 be the original supply curve and due to the improvement in technology, the price falls down to P_0 . So the supply curve will shift to S_0 .

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Q15 How does the imposition of a unit tax affect supply curve of a firm?

Answer. A unit tax is a tax that government imposes per unit sale of output. With imposition of tax, marginal cost will increase, hence there will be a decrease in supply and supply curve will shift towards the left.

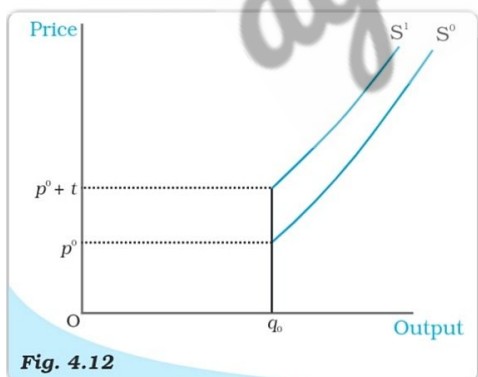


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Here, let the S_0 be the original supply curve and the unit tax imposed be t . So, the price rises to $p_0 + t$. The new supply curve becomes S_1 .

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Q16 How does an increase in the price of an input affect the supply curve of a firm?

Answer. An increase in the price of an input will increase the marginal cost. As a result, the profit margin of the producer will decrease. So, producer will decrease supply and supply curve will shift to left.

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Q17 How does an increase in the number of firms in a market affect the market supply curve?

Answer. With increase in number of firms the supply will be more in the market hence supply curve will shift in the rightward direction. When the number of firms in the market will increase, they will contribute something in the total supply. As a result, the market supply will increase.

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Q18 What does the price elasticity of supply mean? How do we measure it?

Answer. Elasticity of supply can be defined as degree of responsiveness of quantity supplied due to change in price.

$$E_s = \frac{\text{Proportionate change in quantity supplied}}{\text{Proportionate change in Price}}$$

$$E_s = \frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

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Q19 Compute the total revenue, marginal revenue and average revenue schedule in following table. Market price of each unit of good in Rs. 10.

Quantity Sold	0	1	2	3	4	5	6
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Answer. **MR = Price = Rs.10**

AR= price = Rs.10 ;

TR = Quantity sold * price

Quantity Sold	Price	TR	MR	AR
0	10	0	10	10
1	10	10	10	10
2	10	20	10	10
3	10	30	10	10
4	10	40	10	10
5	10	50	10	10
6	10	60	10	10

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Q20 The following table shows the total revenue and total cost schedule of a competitive firm. Calculate the profit at each level of output. Determine also the market price of goods.

Qty. Sold	0	1	2	3	4	5	6	7
TR	0	5	10	15	20	25	30	35
TC	5	7	10	12	15	23	33	40

Answer.

Price= AR= 5

Profit= TR-TC

Units = Q	TR	TC	AR=P = TR/Q	Profit(TR - TC)
0	0	5	0	-

1	5	7	5	(-2)
2	10	10	5	0
3	15	12	5	3
4	20	15	5	5
5	25	23	5	2
6	30	33	5	(-3)
7	35	40	5	(-5)

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Q21 The following table shows the total cost schedule of a competitive firm. It is given that the price of good is Rs. 10. Calculate the profit at each output level. Find the profit maximizing level of output.

Output	0	1	2	3	4	5	6	7	8	9	10
TC	5	15	22	27	31	38	49	63	81	101	123

Answer. **AR=MR=P**

$$TR = AR \times Q$$

Profit=TR-TC

Output	TC	AR=P	TR	Profit
0	5	10	0	-
1	15	10	10	-5
2	22	10	20	-2
3	27	10	30	3
4	31	10	40	9
5	38	10	50	12
6	49	10	60	11
7	63	10	70	7
8	81	10	80	-1
9	101	10	90	-11
10	123	10	100	-23

Profit maximizing level of output is 5th unit as profit is maximum here that is 12.

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Q22 Consider market with two firms the following table shows the supply schedules of two firms the SS_1 column give the supply schedule of firm 1 and SS_2 column gives supply schedule of firm 2. Compute market supply schedule.

Price	SS_1	SS_2
0	0	0
1	0	0
2	0	0
3	1	1
4	2	2
5	3	3
6	4	4

Answer. **S= Market Supply**= SS_1+SS_2

Price	SS_1	SS_2	S (Market Supply)
0	0	0	0
1	0	0	0
2	0	0	0
3	1	1	2
4	2	2	4
5	3	3	6
6	4	4	8

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Q23 Consider the market with two firms. In the following table column labeled as SS_1 and SS_2 gives the supply schedules of firm 1 and firm 2 respectively. Compute the market schedule.

Price	SS_1	SS_2
0	0	0
1	0	0
2	0	0
3	1	0
4	2	0.5
5	3	1
6	4	1.5
7	5	2
8	6	2.5

Answer. Market supply schedule is the summation of individual supply schedule.

$$S = (SS_1) + (SS_2)$$

Price	SS_1	SS_2	$S = SS_1 + SS_2$
0	0	0	0
1	0	0	0
2	0	0	0
3	1	0	1
4	2	0.5	2.5
5	3	1	4
6	4	1.5	5.5
7	5	2	7
8	6	2.5	8.5

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Q24 There are 3 identical firms in a market. The following table shows the supply schedule of firm. Compute the market schedule.

Price	0	1	2	3	4	5	6	7	8
SS_1	0	0	2	4	6	8	10	12	14

Answer. Market supply schedule is the summation of individual supply schedule.

$$S = (SS_1) + (SS_2) + (SS_3)$$

Price	x	SS_2	SS_3	S
0	0	0	0	0
1	0	0	0	0
2	2	2	2	6
3	4	4	4	12
4	6	6	6	18
5	8	8	8	24
6	10	10	10	30
7	12	12	12	36
8	14	14	14	42

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Q25 A firm earns a revenue of Rs. 50 when the market price of a good is Rs. 10, the market price increases to Rs. 15 and the firm earns a revenue of Rs. 150. What is the price elasticity of the firm's supply curve?

Answer.

Market price	Revenue	Quantity
10	50	5
15	150	10

$$P_0 = 10$$

$$T_0R_0 = 50 = Q_0 \times P_0$$

Therefore, z

$$P_1 = 15$$

$$TR_1 = Q_1 \times P_1 = 150$$

Therefore, $Q_1 = 10$

$$E_s = \frac{\Delta Q}{\Delta P} \times \frac{P_0}{Q_0}$$

$$\frac{Q_1 - Q_0}{P_1 - P_0} \times \frac{P_0}{Q_0}$$

f

$$\frac{5}{5} \times \frac{10}{5} = 2$$

$$E_s = 2 .$$

Price elasticity of supply is 2.

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Q26 The market price of a good changes from Rs. 5 to Rs. 20. As a result, the quantity supplied by a firm increases by 15 units. The price elasticity of the firm's supply curve is 0.5. Find initial and final output level of firm?

Answer.

Market price	Supply
5	S
20	S + 15

$$P_0 = 5$$

$$P_1 = 20$$

$$\text{Therefore, } \Delta P = P_1 - P_0 = 20 - 5 = 15$$

$$\Delta Q = Q_1 - Q_0 = 15$$

$$E_s = 0.5$$

Now,

$$E_s = \frac{\Delta Q}{\Delta P} \times \frac{P_0}{Q_0}$$

$$0.5 = \frac{15}{15} \times \frac{5}{Q_0}$$

\approx

$$\Delta Q = Q_1 - Q_0 = 15$$

$$15 = Q_1 - 10$$

$$4y^2$$

Initial output is 10 units and Final output is 25 units.

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Q27 At the market price of Rs. 10, a firm supplies 4 units of output. The market price increases to Rs. 30. The price elasticity of firm's supply is 1.25. What quantity will firm supply at the new price.

Answer.

Market Price	Supply
10	4
30	?

Given :

$$P_0 = 10$$

$$Q_0 = 4$$

$$\int y^{-2} dy = \int -4t^{-3} dt$$

$$\int y^{-2} dy = -4 \int t^{-3} dt$$

$$E_s = 1.25$$

Now,

$$E_s = \frac{\Delta Q}{\Delta P} \times \frac{P_0}{Q_0}$$

$$1.25 = \frac{\Delta Q}{20} \times \frac{10}{4}$$

$$\text{Therefore, } \Delta Q = \frac{1.25 \times 20 \times 4}{10}$$

$$\Delta Q = Q_1 - Q_0 = 15$$

$$10 = Q_1 - 4$$

$$Q_1 = 14$$

Firm will supply 14 units at new price.

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