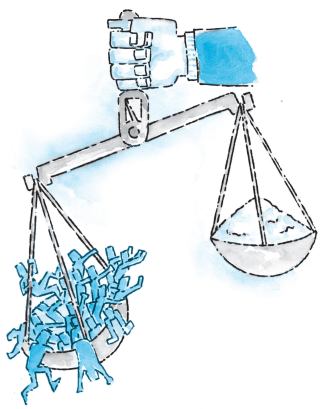
Chapter 6



Non-competitive Markets

We recall that perfect competition was theorised as a market structure where both consumers and firms were price takers. The behaviour of the firm in such circumstances was described in the Chapter 4. We discussed that the perfect competition market structure is approximated by a market satisfying the following conditions:

(i) there exist a very large number of firms and consumers of the commodity, such that the output sold by each firm is negligibly small compared to the total output of all the firms combined, and similarly, the amount purchased by each consumer is extremely small in comparison to the quantity purchased by all consumers together;

(ii) firms are free to start producing the commodity or to stop production;

(iii) the output produced by each firm in the industry is indistinguishable from the others and the output of any other industry cannot substitute this output; and

(iv) consumers and firms have perfect knowledge of the output, inputs and their prices.

In this chapter, we shall discuss situations where one or more of these conditions are not satisfied. If assumptions (i) and (ii) are dropped, we get market structures called monopoly and oligopoly. If assumption (iii) is dropped, we obtain a market structure called monopolistic competition. Dropping of assumption (iv) is dealt with as 'economics of risk'. This chapter will examine the market structures of monopoly, monopolistic competition and oligopoly.

6.1 Simple Monopoly in the Commodity Market

A market structure in which there is a single seller is called monopoly. The conditions hidden in this single line definition, however, need to be explicitly stated. A monopoly market structure requires that there is a single producer of a particular commodity; no other commodity works as a substitute for this commodity; and for this situation to persist over time, sufficient restrictions

'I' 'M' Perfect Competition

are required to be in place to prevent any other firm from entering the market and to start selling the commodity.

Competitive Behaviour versus Competitive Structure

A perfectly competitive market has been defined as one where an individual firm is unable to influence the price at which the product is sold in the market. Since price remains the same for any level of output of the individual firm, such a firm is able to sell any quantity that it wishes to sell at the given market price. It, therefore, does not need to compete with other firms to obtain a market for its produce.

This is clearly the opposite of the meaning of what is commonly understood by competition or competitive behaviour. We see that Coke and Pepsi compete with each other in a variety of ways to achieve a higher level of sales or a greater share of the market. Conversely, we do not find individual farmers competing among themselves to sell a larger amount of crop. This is because both Coke and Pepsi possess the power to influence the market price of soft drinks, while the individual farmer does not.

Thus, competitive behaviour and competitive market structure are, in general, inversely related; the more competitive the market structure, less competitive is the behaviour of the firms. On the other hand, the less competitive the market structure, the more competitive is the behaviour of firms towards each other. Pure monopoly is the most visible exception.

In order to examine the difference in the equilibrium resulting from a monopoly in the commodity market as compared to other market structures, we also need to assume that all other markets remain perfectly competitive. In particular, we need (i) that the market of the particular commodity is perfectly competitive from the demand side ie all the consumers are price takers; and (ii) that the markets of the inputs used in the production of this commodity are perfectly competitive both from the supply and demand side.

If all the above conditions are satisfied, then we define the situation as one of monopoly in a single commodity market.

6.1.1 Market Demand Curve is the Average Revenue Curve

The market demand curve in Figure 6.1 shows the quantities that consumers as a whole are willing to purchase at different prices. If the market price is at the higher level p_0, consumers are willing to purchase the lesser quantity q_0. On the other hand, if the market price is at the lower level p_1, consumers are willing to buy a higher quantity q_1. That is, price in the market affects the quantity demanded by the consumers. This is also expressed by saying that the quantity purchased by the consumers is a decreasing function of the price.

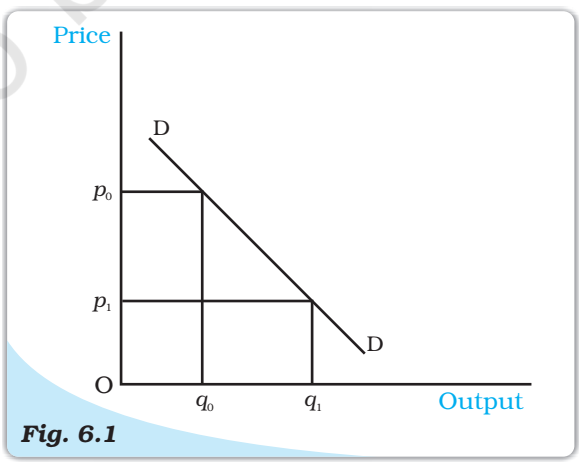


Fig. 6.1

Market Demand Curve. Shows the quantities that consumers as a whole are willing to purchase at different prices.

For the monopoly firm, the above argument expresses itself from the reverse direction. The monopoly firm's decision to sell a larger quantity is possible only at a lower price. Conversely, if the monopoly firm brings a smaller quantity of the commodity into the market for sale it will be able to sell at a higher price. Thus, for the monopoly firm, the price depends on the quantity of the commodity sold. The same is also expressed by stating that price is a decreasing function of the quantity sold. Thus, for the monopoly firm, the market demand curve expresses the price that is available for different quantities supplied. This idea is reflected in the statement that the monopoly firm faces the market demand curve.

The above idea can be viewed from another angle. Since the firm is assumed to have perfect knowledge of the market demand curve, the monopoly firm can decide the price at which it wishes to sell its commodity, and therefore, determines the quantity to be sold. For instance, examining Figure 6.1 again, since the monopoly firm is aware of the shape of the curve DD, if it wishes to sell the commodity at the price p_0, it can do so by producing and selling quantity q_0, since at the price p_0, consumers are willing to purchase the quantity q_0. This idea is concretised in the slogan: 'Monopoly firm is a price maker'.

The contrast with the firm in a perfectly competitive market structure should be clear. In that case, the firm could bring into the market as much quantity of the commodity as it wished and could sell it at the same price. Since this does not happen for a monopoly firm, the amount of money received by the firm through the sale of the commodity has to be examined again.

We do this exercise through a schedule, a graph, and using a simple equation of a straight line demand curve. As an example, let the demand function be given by the equation

$$q = 20 - 2p,$$

where q is the quantity sold and p is the price in rupees.

The equation can be written in terms of p as

$$p = 10 - 0.5q$$

Substituting different values of q from 0 to 13 gives us the prices from 10 to 3.5. These are shown in the q and p columns of Table 6.1.

These numbers are depicted in a graph in Figure 6.2 with prices on the vertical axis and quantities on the horizontal axis. The prices that are available for different quantities of the commodity are shown by the solid straight line D.

The total revenue (TR) received by the firm from the sale of the commodity equals the product of the price and the quantity sold. In the case of the monopoly firm, the total revenue is not a straight line. Its shape depends on the shape of the demand curve. Mathematically, TR is represented as a function of the quantity sold. Hence, in our example

$$\begin{aligned} TR &= p \quad q \\ &= (10 - 0.5q) \quad q \\ &= 10q - 0.5q^2 \end{aligned}$$

Table 6.1: Prices and Revenue

q	p	TR	AR	MR
0	10	0	–	–
1	9.5	9.5	9.5	9.5
2	9	18	9	8.5
3	8.5	25.5	8.5	7.5
4	8	32	8	6.5
5	7.5	37.5	7.5	5.5
6	7	42	7	4.5
7	6.5	45.5	6.5	3.5
8	6	48	6	2.5
9	5.5	49.5	5.5	1.5
10	5	50	5	0.5
11	4.5	49.5	4.5	-0.5
12	4	48	4	-1.5
13	3.5	45.5	3.5	-2.5

This is not the equation of a straight line. It is a quadratic equation in which the squared term has a negative cofficient. Such an equation represents an inverted vertical parabola.

In Table 6.1, the TR column represents the product of the p and q columns. It can be noticed that as the quantity increases, TR increases to Rs 50 when output becomes 10 units, and after this level of output, total revenue starts declining. The same is visible in Figure 6.2.

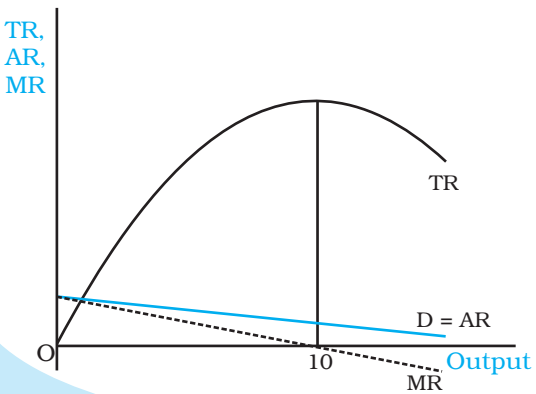


Fig. 6.2

Total, Average and Marginal Revenue Curves: The total revenue, average revenue and the marginal revenue curves are depicted here.

The revenue received by the firm per unit of commodity sold is called the Average Revenue (AR). Mathematically, $AR = TR/q$. In Table 6.1, the AR column provides values obtained by dividing TR values by q values. It can be seen that the AR values turn out to be the same as the values in the p column. This is only to be expected

$$AR = \frac{TR}{q}$$

Since $TR = p\ q$, substituting this into the AR equation

$$AR = \frac{(p \times q)}{q} = p$$

As seen earlier, the p values represent the market demand curve as shown in Figure 6.2. The AR curve will therefore lie exactly on the market demand curve. This is expressed by the statement that the market demand curve is the average revenue curve for the monopoly firm.

Graphically, the value of AR can be found from the TR curve for any level of quantity sold through a simple construction given in Figure 6.3. When quantity is of 6 units, draw a vertical line passing through the value 6 on the horizontal axis. This line will cut the TR curve at the point marked 'a' at a height equal to 42. Draw a straight line joining the origin O and point 'a'. The slope of this ray from the origin to a point on the TR provides the value of AR. The slope of this ray is equal to 7. Therefore, AR has the value 7. The same can be verified from Table 6.1.

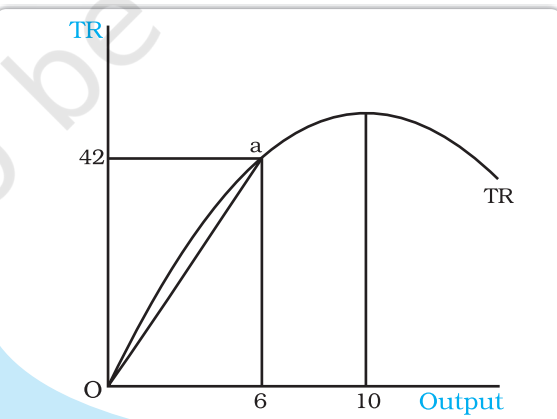


Fig. 6.3

Relation between Average Revenue and Total Revenue Curves. The average revenue at any level of output is given by the slope of the line joining the origin and the point on the total revenue curve corresponding to the output level under consideration.

6.1.2 Total, Average and Marginal Revenues

A more careful glance at Table 6.1 reveals that TR does not increase by the same amount for every unit increase in quantity. Sale of the first unit leads to a change in TR from Rs 0 when quantity is of 0 unit to Rs 9.50 when quantity is 1 unit, i.e., a rise of Rs 9.50. As the quantity increases further, the rise in TR is smaller. For example, for the 5th unit of the commodity, the rise in TR is Rs 5.50 (Rs 37.50 for 5 units minus Rs 32 for 4 units). As mentioned earlier, after 10 units of output, TR starts declining. This implies that bringing more than 10 units for sale leads to a level of TR less than Rs 50. Thus, the rise in TR due to the 12th unit is: 48 – 49.50 = –1.5, ie a fall of Rs 1.50.

This change in TR due to the sale of an additional unit is termed Marginal Revenue (MR). In Table 6.1, this is depicted in the last column. The values in every row of the MR column after the first equal the TR value in that row minus the TR value in the previous row. In the last paragraph, it was shown that TR increases more slowly as quantity sold increases and falls after quantity reaches 10 units. The same can be viewed through the MR values which fall as q increases. After the quantity reaches 10 units, MR has negative values. In Figure 6.2, MR is depicted by the dotted line.

Graphically, the values of the MR curve are given by the slope of the TR curve. The slope of any smooth curve is defined as the slope of the tangent to the curve at that point. This is depicted in Figure 6.4. At point 'a' on the TR curve, the value of MR is given by the slope of the line L_1, and at point 'b' by the line L_2. It can be seen that both lines have positive slope, but the line L_2 is flatter than line L_1, ie its slope is lesser. The value of MR for the same level of quantity is also lesser. When 10 units of the commodity are sold, the tangent to the TR is horizontal, ie its slope is zero. The value of the MR for the same quantity is zero. At point 'd' on the TR curve, where the tangent is negatively sloped, the MR takes a negative value.

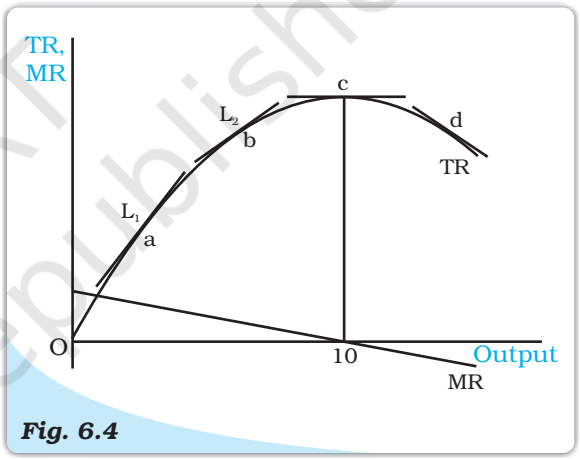


Fig. 6.4

Relation between Marginal Revenue and Total Revenue Curves. The marginal revenue at any level of output is given by the slope of the total revenue curve at that level of output.

We can now conclude that when total revenue is rising, marginal revenue is positive, and when total revenue shows a fall, marginal revenue is negative.

Another relation can be seen between the AR and the MR curves. Figure 6.2 shows that the MR curve lies below the AR curve. The same can be seen in Table 6.1 where the values of MR at any level of output are lower than the corresponding values of AR. We can conclude that if the AR curve (ie the demand curve) is falling steeply, the MR curve is far below the AR curve. On the other hand, if the AR curve is less steep, the vertical distance between the AR and MR curves is smaller. Figure 6.5(a) shows a flatter AR curve while Figure 6.5(b) shows a steeper AR curve. For the same units of the commodity, the difference between AR and MR in panel (a) is smaller than the difference in panel (b).

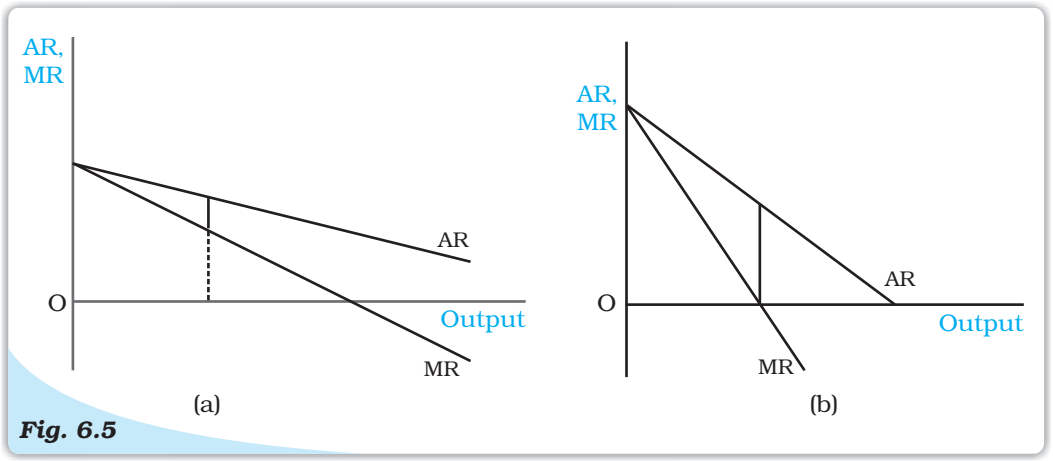


Fig. 6.5

Relation between Average Revenue and Marginal Revenue curves. If the AR curve is steeper, then the MR curve is far below the AR curve.

6.1.3 Marginal Revenue and Price Elasticity of Demand

The MR values also have a relation with the price elasticity of demand. The detailed relation is not derived here. It is sufficient to notice only one aspect– price elasticity of demand is more than 1 when the MR has a positive value, and becomes less than the unity when MR has a negative value. This can be seen in Table 6.2, which uses the same data presented in Table 6.1. As the quantity of the commodity increases, MR value becomes smaller and the value of the price elasticity of demand also becomes smaller. Recall that the demand curve is called elastic at a point where price elasticity is greater than unity, inelastic at a point where the price elasticity is less than unity and unitary elastic when price elasticity is equal to 1. Table 6.2 shows that when quantity is less than 10 units, MR is positive and the demand curve is elastic and when quantity is of more than 10 units, the demand curve is inelastic. At the quantity level of 10 units, the demand curve is unitary elastic.

6.1.4 Short Run Equilibrium of the Monopoly Firm

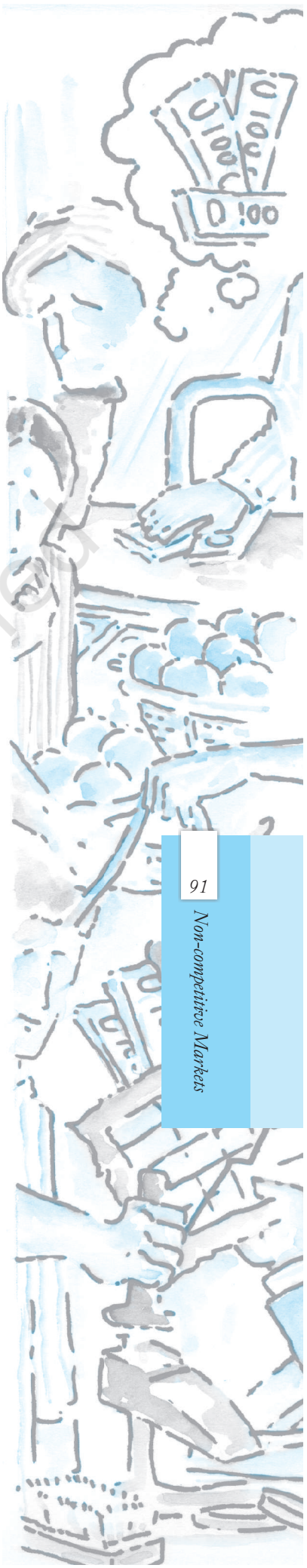
As in the case of perfect competition, we continue to regard the monopoly firm as one which maximises profit. In this section, we analyse this profit maximising behaviour to determine the quantity produced by a monopoly firm and price at which it is sold. We shall assume that a firm does not maintain stocks of the quantity produced and that the entire quantity produced is put up for sale.

The Simple Case of Zero Cost

Suppose there exists a village situated sufficiently far away from other villages. In this village, there is exactly one well from which water is available. All residents are completely dependent for their water

Table 6.2: MR and Price Elasticity

q	p	MR	Elasticity
0	10	-	-
1	9.5	9.5	19
2	9	8.5	9
3	8.5	7.5	5.67
4	8	6.5	4
5	7.5	5.5	3
6	7	4.5	2.33
7	6.5	3.5	1.86
8	6	2.5	1.5
9	5.5	1.5	1.22
10	5	0.5	1
11	4.5	-0.5	0.82
12	4	-1.5	0.67
13	3.5	-2.5	0.54



requirements on this well. The well is owned by one person who is able to prevent others from drawing water from it except through purchase of water. The person who purchases the water has to draw the water out of the well. The well owner is thus a monopolist firm which bears zero cost in producing the good. We shall analyse this simple case of a monopolist bearing zero costs to determine the amount of water sold and the price at which it is sold.

Figure 6.6 depicts the same TR, AR and MR curves, as in Figure 6.2. The profit received by the firm equals the revenue received by the firm minus the cost incurred, that is, Profit = TR – TC. Since in this case TC is zero, profit is maximum when TR is maximum. This, as we have seen earlier, occurs when output is of 10 units. This is also the level when MR equals zero. The amount of profit is given by the length of the vertical line segment from 'a' to the horizontal axis.

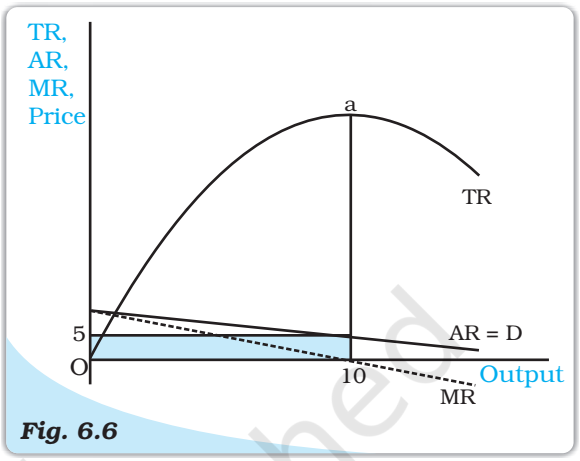


Fig. 6.6

Short Run Equilibrium of the Monopolist with Zero Costs. The monopolist's profit is maximised at that level of output for which the total revenue is the maximum.

The price at which this output will be sold is the price that the consumers as a whole are willing to pay. This is given by the market demand curve D. At output level of 10 units, the price is Rs 5. Since the market demand curve is the AR curve for the monopolist firm, Rs 5 is the average revenue received by the firm. The total revenue is given by the product of AR and the quantity sold, ie Rs 5 10 units = Rs 50. This is depicted by the area of the shaded rectangle.

Comparison with Perfect Competition

We compare the above outcome with what it would be under perfectly competitive market structure. Let us assume that there is an infinite number of such wells. If one well owner charges Rs 5 per unit of water to get a profit of Rs 50, another well owner realising there are still consumers willing to buy water at a lower rate, will fix the price lower than Rs 5, say at Rs 4. Consumers will decide to purchase from the second water seller and demand a larger quantity of 12 units creating a total revenue of Rs 48. In similar fashion, another water seller, in order to obtain the revenue, would offer a still lower price, say Rs 3, and selling 14 units earning a revenue of Rs 42. Since there is an infinite number of firms, price would continue to move down infinitely till it reaches zero. At this output, 20 units of water would be sold and profit would become zero.

Through this comparison, we can see that a perfectly competitive equilibrium results in a larger quantity being sold at a lower price. We can now proceed to the general case involving positive costs of production.

Introducing Positive Costs

Analysing using Total curves

In Chapter 3, we have discussed the concept of cost and the shape of the total cost curve having been depicted as shown by TC in Figure 6.7. The TR curve is also drawn in the same diagram. The profit received by the firm equals the total revenue minus the total cost. In the figure, we can see that if quantity q_1 is

produced, the total revenue is TR_1 and total cost is TC_1. The difference, $TR_1 - TC_1$, is the profit received. The same is depicted by the length of the line segment AB, i.e., the vertical distance between the TR and TC curves at q_1 level of output. It should be clear that this vertical distance changes for diferent levels of output. When output level is less than q_2, the TC curve lies above the TR curve, i.e., TC is greater than TR, and therefore profit is negative and the firm makes losses.

The same situation exists for output levels greater than q_3. Hence, the firm can make positive profits only at output levels between q_2 and q_3, where TR curve lies above the TC curve. The monopoly firm will choose that level of output which maximises its profit. This would be the level of output for which the vertical distance between the TR and TC is maximum and TR is above the TC, i.e., TR – TC is maximum. This occurs at the level of output q_0. If the difference TR – TC is calculated and drawn as a graph, it will look as in the curve marked 'Profit' in Figure 6.7. It should be noticed that the Profit curve has its maximum value at the level of output q_0.

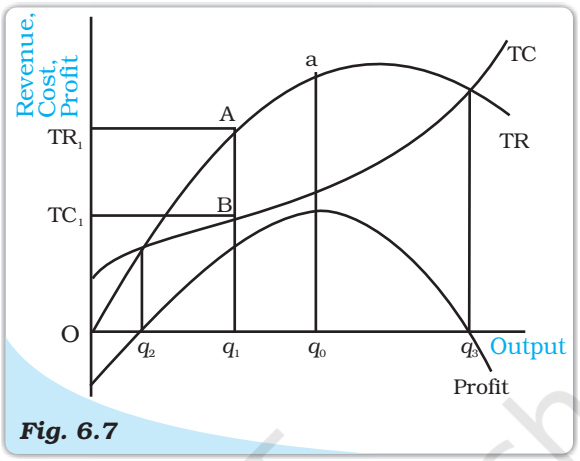


Fig. 6.7

Equilibrium of the Monopolist in terms of the Total Curves. The monopolist's profit is maximised at the level of output for which the vertical distance between the TR and TC is a maximum and TR is above the TC.

The price at which this output is sold is the price consumers are willing to pay for this q_0 quantity of the commodity. So the monopoly firm will charge the price corresponding to the quantity level q_0 on the demand curve.

Using Average and Marginal curves

The analysis shown above can also be conducted using Average and Marginal Revenue and Average and Marginal Cost. Though a bit more complex, this method is able to exhibit the process in greater light.

In Figure 6.8, the Average Cost (AC), Average Variable Cost (AVC) and Marginal Cost (MC) curves are drawn along with the Demand (Average Revenue) Curve and Marginal Revenue crve.

It may be seen that at quantity level below q_0, the level of MR is higher than the level of MC. This means that the increase in total revenue from selling an extra unit of the commodity is greater than the increase in total cost for producing the additional unit. This implies that an additional unit of output would create additional profits since Change in profit = Change in TR – Change in TC.

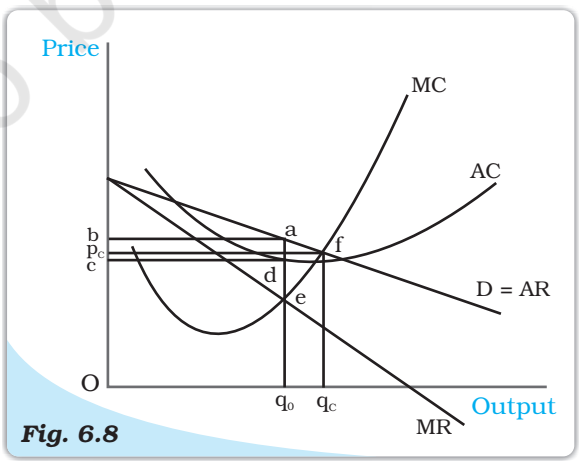


Fig. 6.8

Equilibrium of the Monopolist in terms of the Average and the Marginal Curve. The monopolist's profit is maximised at that level of output for which the MR = MC and the MC is rising.

Therefore, if the firm is producing a level of output less than q_0, it would desire to increase its output since that would add to its profits. As long as the MR curve lies above the MC curve, the reasoning provided above would apply and thus the firm would increase its output. This process comes to a halt when the firm reaches an output level of q_0 since at this level MR equals MC and increasing output provides no increase in profits.

On the other hand, if the firm was producing a level of output which is greater than q_0, MC is greater than MR. This means that the lowering of total cost by reducing one unit of output is greater than the loss in total revenue due to this reduction. It is therefore advisable for the firm to reduce output. This argument would hold good as long as the MC curve lies above the MR curve, and the firm would keep reducing its output. Once output level reaches q_0, the values of MC and MR become equal and the firm stops reducing its output.

Since the firm inevitably reaches the output level q_0, this level is called the equilibrium level of output. Since this equilibrium level of output corresponds to the point where the MR equals MC, this equality is called the equilibrium condition for the output produced by a monopoly firm.

At this equilibrium level of output q_0, the average cost is given by the point '*d*' where the vertical line from q_0 cuts the AC curve. The average cost is thus given by the height dq_0. Since total cost equals the product of AC and the quantity produced being q_0, the same is given by the area of the rectangle Oq_0dc.

As shown earlier, once the quantity of output produced is determined, the price at which it is sold is given by the amount that the consumers are willing to pay, as expressed through the market demand curve. Thus, the price is given by the point '*a*' where the vertical line through q_0 meets the market demand curve D. This provides price given by the height aq_0. Since the price received by the firm is the revenue per unit of output, it is the Average Revenue for the firm. The total revenue being the product of AR and the level of output q_0, can be shown as the area of the rectangle Oq_0ab.

It can be seen from the diagram that the area of the rectangle Oq_0ab is larger than the area of the rectangle Oq_0dc, i.e., TR is greater than TC. The difference is the area of the rectangle *cdab*. Thus, Profit = TR – TC which can be represented by this area *cdab*.

Comparison with Perfect Competition again

We compare the monopoly firm's equilibrium quantity and price with that of the perfectly competitive firm. Recall that the perfectly competitive firm was a price taker. Given the market price, the firm in a perfectly competitive market structure believed that it could not alter the price by producing more of the output or less of it.

Suppose that the firm, whose equilibrium we were considering above, believed that it was a perfectly competitive firm. Then, given its level of output at q_0, price of the commodity at $aq_0 = Ob$, it would expect the price to remain fixed at *Ob*, and therefore, every additional unit of output could be sold at that price. Since the cost of producing an additional unit, given by the MC, stands at eq_0 which is less than aq_0, the firm would expect a gain in profit by increasing the output. This would continue as long as the price remained higher than the MC. At the point '*f*' in Figure 6.8, where the MC curve cuts the demand curve, price received by the firm becomes equal to the MC. Hence, it would no longer be considered beneficial by this perfectly competitive firm to increase output. It is for this reason that Price = Marginal Cost that is considered the equilibrium condition for the perfectly competitive firm.

The diagram shows that at this level of output, the quantity produced q_c is greater than q_0. Also, the price paid by the consumers is lower at p_c. From this we conclude that the perfectly competitive market provides a production and sale of a larger quantity of the commodity compared to a monopoly firm. Further the price of the commodity under perfect competition is lower compared to monopoly. The profit earned by the perfectly competitive firm is also smaller.

In the Long Run

We saw in Chapter 5 that with free entry and exit, perfectly competitive firms obtain zero profits. That was due to the fact that if profits earned by firms were positive, more firms would enter the market and the increase in output would bring the price down, thereby decreasing the earnings of the existing firms. Similarly, if firms were facing losses, some firms would close down and the reduction in output would raise prices and increase the earnings of the remaining firms. The same is not the case with monopoly firms. Since other firms are prevented from entering the market, the profits earned by monopoly firms do not go away in the long run.

Some Critical Views

The results presented above portray an extremely negative picture of the impact of monopoly in a commodity market: the monopoly firms solely benefit themselves, at the cost of consumers. The monopoly firm receives a higher profit and a positive profit even in the long run. On the other hand, consumers get a lesser quantity of the output and have to pay more for each unit consumed.

However, varying views have been expressed by economists concerning the question of monopoly. First, it can be argued that monopoly of the kind described above cannot exist in the real world. This is because all commodities are, in a sense, substitutes for each other. This in turn is because of the fact that all the firms producing commodities, in the final analysis, compete to obtain the income in the hands of consumers.

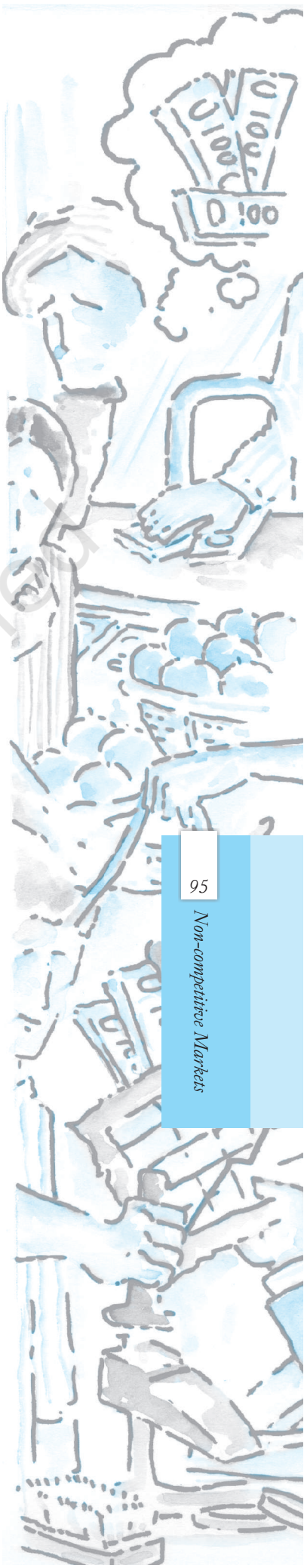
Another argument is that even a firm in a pure monopoly situation is never without competition. This is because the economy is never stationary. New commodities using new technologies are always coming up, which are close substitutes for the commodity produced by the monopoly firm. Hence, the monopoly firm always has competition in the long run. Even in the short run, the threat of competition is always present and the monopoly firm is unable to behave in the manner we have described above.

Still another view argues that the existence of monopolies may be beneficial to society. Since monopoly firms earn large profits, they possess sufficient funds to take up research and development work, something which the small perfectly competitive firm is unable to do. By doing such research, monopoly firms are able to produce better quality goods. Also, because of the more modern technologies which such firms are able to use, their marginal cost may be so much lower that the equilibrium level of output, where MC = MR, may be even larger than that in the case of perfect competition.

6.2 Other Non-perfectly Competitive Markets

6.2.1 Monopolistic Competition

We now consider a market structure where the number of firms is large, there is free entry and exit of firms, but the goods produced by them are not homogeneous. Such a market structure is called monopolistic competition.



This kind of a structure is more commonly visible. There is a very large number of biscuit producing firms, for example. But many of the biscuits being produced are associated with some brand name and are distinguishable from one another by these brand names and packaging and are slightly different in taste. The consumer develops a taste for a particular brand of biscuit over time, or becomes loyal to a particular brand for some reason, and is, therefore, not immediately willing to substitute it for another biscuit. However, if the price difference becomes large, the consumer would be willing to choose a biscuit of another brand. The price difference required for the consumer to change the brand consumed may vary. Therefore, if price of a particular brand is lowered, some consumers will shift to consuming that brand. Further, lowering of the price will lead to more consumers shifting to the brand with the lower price.

Hence, the demand curve faced by the firm is not horizontal (perfectly elastic) as is the case with perfect competition. The demand curve faced by the firm is not the market demand curve, as in the case with monopoly. In the case of monopolistic competition, the firm expects small increases in demand if it lowers the price. Hence, the marginal revenue is slightly less than the average revenue. The firm increases its output whenever the marginal revenue is greater than the marginal cost. But since the marginal revenue is lower than the price, the marginal revenue becomes equal to the marginal cost at a lower level of output compared to perfect competition.

For this reason, the monopolistic competitive firm produces lower output as compared to the perfectly competitive firm. Given lower output, since consumers as a whole are willing to pay more per unit, the price of the commodity becomes higher than the price under perfect competition.

The situation described above is one that exists in the short run. But the market structure of monopolistic competition allows for new firms to enter the market. If the firms in the industry are receiving positive amounts of profit in the short run, this will attract new firms to start producing the commodity (entry into the market). As output of the commodity expands, prices in the market will tend to fall till profits become zero and there is now no attraction for new firms to enter. Conversely, if firms in the industry are facing losses in the short run, some firms would stop producing (exit from the market) the commodity and the fall in total quantity produced would lead to a higher price. Entry or exit would halt once profits become zero and this would serve as the long run equilibrium.

Since the demand of the output of each firm continues to increase with a fall in the price of its brand, the long run equilibrium continues to be associated with a lower level of total output and a higher price as compared to perfect competition.

6.2.2 How do Firms behave in Oligopoly?

If the market of a particular commodity consists of more than one seller but the number of sellers is few, the market structure is termed oligopoly. The special case of oligopoly where there are exactly two sellers is termed duopoly. In analysing this market structure, we assume that the product sold by the two firms is homogeneous and there is no substitute for the product, produced by any other firm.

Given that there are a few firms, the output decisions of any one firm would necessarily affect the market price and therefore the amount sold by the other firms as also their total revenues. It is, therefore, only to be expected that other firms would react to protect their profits. This reaction would be through taking

fresh decisions about the quantity and price of their own output. There are various ways in which this can be theorised. We briefly explain two of them.

Firstly duopoly firms may collude together and decide not to compete with each other and maximise total profits of the two firms together. In such a case the two firms would behave like a single monopoly firm that has two different factories producing the commodity.

Secondly, take the case of a duopoly where each of the two firms decides how much quantity to produce by maximising its own profit assuming that the other firm would not change the quantity that it is supplying.

We can examine the impact using a simple example where both the duopolist firms have zero cost. A similar situation in the case of monopoly was earlier considered in The Simple Case of Zero Cost in section 6.1.4. Recall that in that case we were able to show that given a straight line demand curve, the maximum quantity demanded by the consumers was 20 units at zero price, and this would have been the equilibrium in case of a perfectly competitive market structure. Given a monopoly structure, the quantity supplied was 10 units at a price of Rs 5. It can be shown that whenever the demand curve is a straight line and total cost is zero, the monopolist finds it most profitable to supply half of the maximum demand of the good. Let us use the same example to examine the outcome in case there were two duopoly firms, A and B behaving in the manner described above.

Assume that Firm B supplies zero units of the good, then Firm A realizing that maximum demand is 20 units, would decide to supply half of it, i.e. 10 units. Given that Firm A is supplying 10 units, Firm B would realize that out of the maximum demand of 20 units, a demand of 10 units (i.e. 20 minus 10) still exists and hence would supply half of it, i.e. 5 units. Since firm B has changed its supply from zero to 5 units, Firm A would realize that the total demand is 15 units (i.e., 20 minus 5) and supply half to it, i.e., 7.5 units. In the fashion, the two firms would keep making moves. It can be shown that these lead to an equilibrium. Let us examine these steps:

Step	Firm	Quantity Supplied
1	B	0
2	A	$\frac{1}{2}\ 20 = \frac{20}{2}$
3	B	$\frac{1}{2}(20 - \frac{1}{2}\ 20) = \frac{20}{2} - \frac{20}{4}$
4	A	$\frac{1}{2}(20 - \frac{1}{2}(20 - \frac{1}{2}\ 20)) = \frac{20}{2} - \frac{20}{4} + \frac{20}{8}$
5	B	$\frac{1}{2}(20 - \frac{1}{2}(20 - \frac{1}{2}(20 - \frac{1}{2}\ 20))) = \frac{20}{2} - \frac{20}{4} + \frac{20}{8} - \frac{20}{16}$

And so on.

Therefore both the firms would finally supply an output equal to

$$\frac{20}{2} - \frac{20}{4} + \frac{20}{8} - \frac{20}{16} + \frac{20}{32} - \frac{20}{64} + \frac{20}{128} \ldots = \frac{20}{3}$$

The total quantity supplied in the market equals the sum of the quantity supplied by the two firms is

$$\frac{20}{3} + \frac{20}{3} = 2\ \frac{20}{3}$$

which is greater than the quantity supplied under a monopoly market structure and less than the quantity supplied under a perfectly competitive structure. Since price depends on the quantity supplied by the formula $p = 10 - 0.5q$, for $q = \frac{40}{3}$, price is $10 - \frac{20}{3}$ = Rs 3.33. This is lower than the price under monopoly and higher than under perfect competition.

Even in the case where there are positive costs, the mathematics only becomes more complex, but the results are similar. That through a very large number of moves and countermoves, the two firm reach an equilibrium quantity of total output. The quantity produced by both firms together is more than what a pure monopoly would have produced and lesser than that produced if the market structure was perfectly competitive. The equilibrium market price is naturally lower than in the case of pure monopoly and higher than under perfect competition.

Thirdly, some economists argue that oligopoly market structure makes the market price of the commodity rigid, i.e. the market price does not move freely in response to changes in demand. The reason for this lies in the way in which oligopoly firms react to a change in price initiated by any firm. If one firm feels that a price increase would generate higher profits, and therefore increases the price at which it sells its output, other firms do not follow. The price increase would therefore lead to a huge fall in the quantity sold by the firm leading to a fall in its revenue and profit. It is therefore not rational for any firm to increase the price. On the other hand, a firm may estimate that it could earn a larger revenue and profit by selling a larger quantity of output and therefore lowers the price at which it sells the commodity. Other firms would perceive this action as a threat and therefore follow the first firm and lower their price as well. The increase in the total quantity sold due to the lowering of price is therefore shared by all the firms, and the firm that had initially lowered the price is able to achieve only a small increase in the quantity it sells. A relatively large lowering of price by the first firm leads to a relatively small increase in the quantity sold. Thus, this firm experiences an inelastic demand curve and its decision to lower price leads to a lowering of its revenue and profit. Any firm therefore finds it irrational to change the prevailing price, leading to prices that are more rigid compared to perfect competition.

Summary

- The market structure called monopoly exists where there is exactly one seller in any market.
- A commodity market has a monopoly structure, if there is one seller of the commodity, the commodity has no substitute, and entry into the industry by another firm is prevented.
- The market price of the commodity depends on the amount supplied by the monopoly firm. The market demand curve is the average revenue curve for the monopoly firm.
- The shape of the total revenue curve depends on the shape of the average revenue curve. In the case of a negatively sloping straight line demand curve, the total revenue curve is an inverted vertical parabola.
- Average revenue for any quantity level can be measured by the slope of the line from the origin to the relevant point on the total revenue curve.
- Marginal revenue for any quantity level can be measured by the slope of the tangent at the relevant point on the total revenue curve.

- The average revenue is a declining curve if and only if the value of the marginal revenue is lesser than the average revenue.
- The steeper is the negatively sloped demand curve, the further below is the marginal revenue curve.
- The demand curve is elastic when marginal revenue has a positive value, and inelastic when the marginal revenue has a negative value.
- If the monopoly firm has zero costs or only has fixed cost, the quantity supplied in equilibrium is given by the point where marginal revenue is zero. In contrast, perfect competition would supply an equilibrium quantity given by the point where average revenue is zero.
- Equilibrium of a monopoly firm is defined as the point where MR = MC and MC is rising. This point provides the equilibrium quantity produced. The equilibrium price is provided by the demand curve given the equilibrium quantity.
- Positive short run profit to a monopoly firm continue in the long run.
- Monopolistic competition in a commodity market arises due to the commodity being non-homogenous.
- In monopolistic competition, the short run equilibrium results in quantity produced being lesser and prices being higher compared to perfect competition. This situation persists in the long run, but long run profits are zero.
- Oligopoly in a commodity market occurs when there are a small number of firms producing a homogenous commodity.

Key Concepts

Monopoly
Monopolistic Competition
Oligopoly.

Exercises

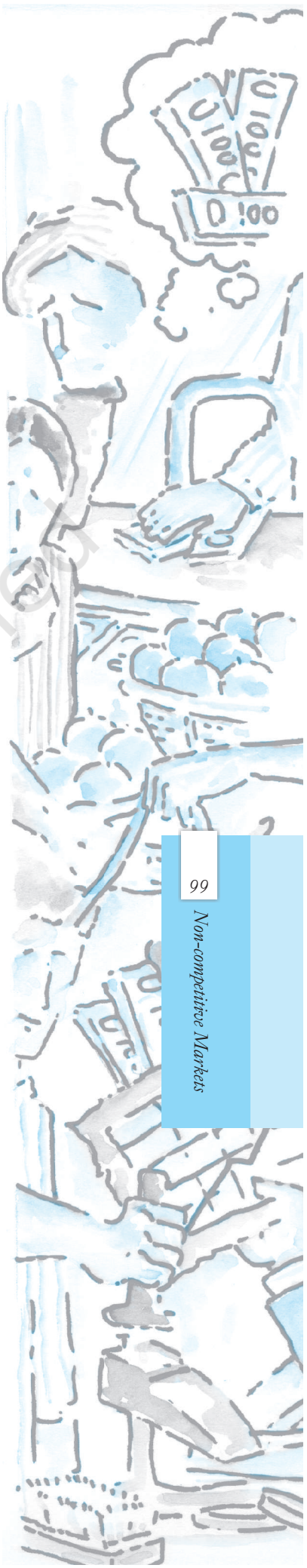
1. What would be the shape of the demand curve so that the total revenue curve is
   (a) a positively sloped straight line passing through the origin?
   (b) a horizontal line?
2. From the schedule provided below calculate the total revenue, demand curve and the price elasticity of demand:

Quantity	1	2	3	4	5	6	7	8	9
Marginal Revenue	10	6	2	2	2	0	0	0	-5

3. What is the value of the MR when the demand curve is elastic?
4. A monopoly firm has a total fixed cost of Rs 100 and has the following demand schedule:

Quantity	1	2	3	4	5	6	7	8	9	10
Price	100	90	80	70	60	50	40	30	20	10

Find the short run equilibrium quantity, price and total profit. What would be the equilibrium in the long run? In case the total cost was Rs 1000, describe the equilibrium in the short run and in the long run.



5. If the monopolist firm of Exercise 3, was a public sector firm. The government set a rule for its manager to accept the goverment fixed price as given (i.e. to be a price taker and therefore behave as a firm in a perfectly competitive market), and the government decide to set the price so that demand and supply in the market are equal. What would be the equilibrium price, quantity and profit in this case?
6. Comment on the shape of the MR curve in case the TR curve is a (i) positively sloped straight line, (ii) horizontal straight line.
7. The market demand curve for a commodity and the total cost for a monopoly firm producing the commodity is given by the schedules below. Use the information to calculate the following:

Quantity	0	1	2	3	4	5	6	7	8
Price	52	44	37	31	26	22	19	16	13

Quantity	0	1	2	3	4	5	6	7	8
Total Cost	10	60	90	100	102	105	109	115	125

   (a) The MR and MC schedules
   (b) The quantites for which the MR and MC are equal
   (c) The equilibrium quantity of output and the equilibrium price of the commodity
   (d) The total revenue, total cost and total profit in equilibrium.
8. Will the monopolist firm continue to produce in the short run if a loss is incurred at the best short run level of output?
9. Explain why the demand curve facing a firm under monopolistic competition is negatively sloped.
10. What is the reason for the long run equilibrium of a firm in monopolistic competition to be associated with zero profit?
11. List the three different ways in which oligopoly firms may behave.
12. If duopoly behaviour is one that is described by Cournot, the market demand curve is given by the equation $q = 200 - 4p$, and both the firms have zero costs, find the quantity supplied by each firm in equilibrium and the equilibrium market price.
13. What is meant by prices being rigid? How can oligopoly behaviour lead to such an outcome?