I. How Monopoly Arises

A. A monopoly is an industry in which there is only one supplier of a product with no close substitutes and in which barriers to entry prevent the entry of other firms.
   1. If there are close substitutes for the product, the firm is not a monopoly because it faces competition from producers of the substitutes.

B. Barriers to entry are hurdles that prevent new firms from entering an industry. Barriers to entry may be legal or natural barriers.
   1. Legal barriers to entry create legal monopolies. Examples of legal barriers include:
      a) Public franchise — granting a legal right that allows only one firm the liberty to produce the product. For example, the U.S. Postal Service has a public franchise to deliver first-class mail.
      b) Government license — requiring a license or certificate to work in an occupation. For instance, a license is required to practice law. Licensing does not necessarily create a monopoly but it does restrict competition.
      c) Patent — granting an exclusive right to the inventor of a product or service. By granting the patent holder the property right to any economic profit from the product, patents spur innovation.

   2. Natural barriers to entry create natural monopolies. Natural monopolies can occur when economies of scale allow one firm to supply the entire market at a lower cost than would be possible if two or more firms were in the industry. Public utilities often are deemed to be natural monopolies.

II. Single-Price Monopoly

A. A single-price monopoly charges the same price for every unit of output it sells. The monopoly must decide how much to produce and what price to charge.

B. The demand curve facing the monopoly is the same as the industry demand curve.

C. Marginal revenue, \( MR \), is the change in total revenue from producing and selling an additional unit of output. The key feature of a single-price monopoly is that marginal revenue is less than the price; that is, \( MR < P \).

   1. Marginal revenue is less than the price because the monopoly must lower its price to sell an additional unit of output. Hence the increased sale raises the firm's revenue by the amount of the price, but this increase is offset by the (now) lower price, which reduces the amount collected on the sale of the initial units produced.
2. If demand is elastic, total revenue increases when the monopoly lowers its price to sell an additional unit of output. Hence the MR is positive.
3. If demand is unit elastic, total revenue does not change when the monopoly lowers its price to sell an additional unit of output, and MR = 0.
4. If demand is inelastic, total revenue decreases when the monopoly lowers its price to sell an additional unit of output. As a result, the MR is negative.
   a) A single-price monopoly never produces a level of output for which demand is inelastic. If it did, the firm could boost its profit by curbing its production, thereby simultaneously raising its revenue and lowering its costs.

D. The technology and cost constraints for a monopoly firm are similar to those for perfectly competitive firms. However, the monopoly faces a different market constraint because its actions affect the price it receives for its product.

E. The monopoly maximizes its profit by producing the level of output at which its marginal revenue equals its marginal cost (MR = MC). The monopoly determines its price from the demand curve as the highest price possible to charge and still sell the amount it produces. This situation is illustrated in Figure 1, where the monopoly produces $Q$ and sets price equal to $P$.

III. Price Discrimination
   A. Price discrimination occurs when some customers are charged a higher price than others for the identical good or when an individual customer is charged more per item on a small purchase than a large purchase even though the costs of selling to the different customers or the different number of units are the same.
   1. Perfect price discrimination occurs when "a firm charges a different price for each unit sold and charges each customer the highest price he or she is willing to pay."

B. Price discrimination increases the firm's total revenue. By price discriminating the monopoly is able to capture as extra revenue some of the consumer surplus.

C. One method of price discrimination charges a single buyer different prices on each unit of the good purchased. Initial units consumed, with potentially more consumer surplus, are priced higher than later units, which have less consumer surplus.

D. Another method of price discrimination charges higher prices to consumers who more highly value consumption of an additional unit of a good. Customers with a low elasticity of demand are charged a higher price than customers with a high elasticity.
IV. Comparing Monopoly and Competition

A. Compared to an identical perfectly competitive industry, a single-price monopoly produces less output and charges a higher price.

B. In general, relative to a perfectly competitive industry, a monopoly charges a higher price and produces less output, although the more perfectly the monopoly can price discriminate the closer is its output to the competitive level.

1. A monopoly able to perfectly price discriminate produces the same output as a perfectly competitive industry but charges a higher price for all except the last unit sold.

C. Monopolies are allocatively inefficient because their output restriction/price elevation creates a loss in consumer and producer surplus. This loss is the deadweight loss.

1. Producer surplus is analogous to consumer surplus; it is the difference between the price the producer actually receives for the product less the minimum price the producer would have accepted to supply the unit.
2. Deadweight loss “measures allocative inefficiency as the reduction in consumer and producer surplus resulting from a restriction of output below its efficient level.”
   a) A perfectly price-discriminating monopoly creates no deadweight loss and is allocatively efficient.
   b) Single-price monopolies capture some of the consumer surplus. Monopolies that can price discriminate obtain more of the consumer surplus and monopolies that can perfectly price discriminate capture all the consumer surplus.

D. Monopolies can earn an economic profit indefinitely, so people have an incentive to create a monopoly. Rent seeking is the activity of trying to establish a monopoly.

1. Rent seeking is costly. People are willing to spend on rent seeking an amount equal to the economic profit that results from creating the monopoly.
2. Because rent seeking uses resources, the total cost imposed on society by a monopoly equals the sum of the deadweight loss and the value of resources used in rent seeking.

E. Monopolies may benefit society through economies of scale and scope and through an incentive to innovate.

1. Monopolies frequently exist because of economies of scale (when the ATC decreases as the firm expands output) or economies of scope (when the ATC decreases as the number of different goods produced increases). In these cases,
the $MC$ may be lower for a monopoly than for a competitive industry comprising many small firms. The monopoly may produce more output and charge a lower price than would a perfectly competitive industry.

2. Patents, which assign an inventor a temporary monopoly, may increase the pace of innovation. The evidence is unclear about whether monopoly firms increase the rate of patenting; however, the evidence does suggest that large firms more quickly adopt new technological advances.
A Numerical Example of a Monopoly Firm's Average, Marginal, and Total Revenues

<table>
<thead>
<tr>
<th>(i) Price (average revenue)</th>
<th>(ii) Quantity sold</th>
<th>(iii) Total revenue ( p(q) )</th>
<th>(iv) Change in total revenue ( \Delta TR )</th>
<th>(v) Marginal revenue ( \Delta TR/\Delta q )</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0</td>
<td>0</td>
<td>90</td>
<td>9</td>
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<tr>
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Marginal revenue is less than price because price must be lowered to sell an extra unit. Columns (i) and (iii) of the table give specific points on the demand curve; average and marginal revenue curves for a Monopoly Firm.
For a monopolist, $MR$ is always less than price; when $TR$ is rising, $MR$ is greater than zero and elasticity is greater than one. The monopoly firm's demand curve is its $AR$ curve; the $MR$ curve is below.
FIGURE 12.4
A Monopoly’s Output and Price

(a) Total revenue and total cost curves

(b) Demand and marginal revenue and cost curves

Economic profit = $12
Short-Run Profit-maximizing Position of a Monopolist

Profit-maximizing output is \( q_0 \), where \( MR = MC \); price is \( p_0 \), which is above \( MC \) at that output.
Figure 6.5  Monopolist with suboptimal plant and excess capacity
Figure 6.6  Monopolist operating in a large market: his plant is larger than the optimal ($e$) and it is being overutilised (at $e'$).
that is

\[
\begin{bmatrix}
\text{slope} \\
\text{of } MR
\end{bmatrix} < \begin{bmatrix}
\text{slope} \\
\text{of } MC
\end{bmatrix}
\]

A numerical example

Given the demand curve of the monopolist

\[ X = 50 - 0.5P \]

which may be solved for \( P \)

\[ P = 100 - 2X \]

Given the cost function of the monopolist

\[ C = 50 + 40X \]

The goal of the monopolist is to maximise profit

\[ \Pi = R - C \]

(i) We first find the \( MR \)

\[ R = XP = X(100 - 2X) \]

\[ R = 100X - 2X^2 \]

\[ MR = \frac{\partial R}{\partial X} = 100 - 4X \]

(ii) We next find the \( MC \)

\[ C = 50 + 40X \]

\[ MC = \frac{\partial C}{\partial X} = 40 \]

(iii) We equate \( MR \) and \( MC \)

\[ MR = MC \]

\[ 100 - 4X = 40 \]

\[ X = 15 \]

(iv) The monopolist's price is found by substituting \( X = 15 \) into the demand-price equation

\[ P = 100 - 2X = 70 \]

(v) The profit is

\[ \Pi = R - C = 1050 - 650 = 400 \]

This profit is the maximum possible, since the second-order condition is satisfied:

(a) from

\[ \frac{\partial C}{\partial X} = 40 \]

we have

\[ \frac{\partial^2 C}{\partial X^2} = 0 \]
(b) from

\[ \frac{\partial R}{\partial X} = 100 - 4X \]

we have \[ \frac{\partial^2 R}{\partial X^2} = -4 \]

Clearly \(-4 < 0\).

We may now re-examine the statement that there is no unique supply curve for the monopolist derived from his MC. Given his MC, the same quantity may be offered at different prices depending on the price elasticity of demand. Graphically this is shown in figure 6.3. The quantity \(X\) will be sold at price \(P_1\) if demand is \(D_1\), while the same

![Figure 6.3](image)

quantity \(X\) will be sold at price \(P_2\) if demand is \(D_2\). Thus there is no unique relationship between price and quantity. Similarly, given the MC of the monopolist, various quantities may be supplied at any one price, depending on the market demand and the corresponding MR curve. In figure 6.4 we depict such a situation. The cost conditions are represented by the MC curve. Given the costs of the monopolist, he would supply \(0X_1\), if the market demand is \(D_1\), while at the same price, \(P\), he would supply only \(0X_2\) if the market demand is \(D_2\).

![Figure 6.4](image)

**B. Long-Run Equilibrium**

In the long run the monopolist has the time to expand his plant, or to use his existing plant at any level which will maximise his profit. With entry blocked, however, it is not