CHAPTER 9
IMPERFECT COMPETITION AND ITS POLAR CASE OF MONOPOLY

I. CHAPTER OVERVIEW

The perfectly competitive market model described in Chapter 8 is important because it gives us a benchmark from which to compare markets as they are observed in the “real world.” In fact, there are very few examples of perfect competition that exist; farming and textiles are close, but myriad government polices exist, from acreage restrictions to import quotas, that alter the behavior of firms.

This chapter presents the sources and patterns of imperfect competition, as well as a theoretical discussion of monopoly (the polar opposite of perfect competition) based upon the notions of marginal cost and marginal revenue. The main theme is illustrated in the quotation from Adam Smith’s Wealth of Nations that precedes the text chapter: “The monopolists, by keeping the market constantly understocked, . . . sell their commodities much above the natural price, and raise their emoluments, whether they consist of wages or profit . . . .” In other words, the loss of perfect competition occurs when firms differentiate their products and gain control over price; the resulting concentration of industry, at any level, leads to lower output and higher prices for consumers as well as market and political power for monopolists.

II. LEARNING OBJECTIVES

After you have read Chapter 9 in your text and completed the exercises in this Study Guide chapter, you should be able to:

1. Define and describe the patterns of imperfect competition.
2. Compare the three varieties of imperfect competitors: monopoly, oligopoly, and monopolistic competition.
3. Discuss the sources of imperfect competition, namely, cost conditions and barriers to entry.
4. Explain the concept of marginal revenue as it applies to the monopolist. Calculate marginal revenue given data on market demand.
5. Define and illustrate the process of determining the profit-maximizing level of output for the monopolist.
6. Contrast the profit-maximizing rule for a perfect competitor with the profit-maximizing rule for a monopolist, and show that perfect competition can be described as a special case of the general MC = MR rule.
7. Recognize the importance of the marginal principle, and apply it to the decision-making process.

III. REVIEW OF KEY CONCEPTS

Match the following terms from column A with their definitions in column B.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>_ Imperfect</td>
<td>1. Allow a firm to maintain monopoly in production for a period of 17 years as a competition return to development of a new product.</td>
</tr>
<tr>
<td>_ Monopoly</td>
<td>2. Occurs when firms in an industry try to make their products look or seem different from the products of rivals.</td>
</tr>
<tr>
<td>_ Oligopoly</td>
<td>3. Factors that make it hard for new firms to enter an industry.</td>
</tr>
<tr>
<td>_ Monopolistic competition</td>
<td>4. An industry in which a single seller has complete control over output and price.</td>
</tr>
<tr>
<td>_ Product differentiation</td>
<td>5. Entry barriers which protect domestic producers from foreign producers.</td>
</tr>
<tr>
<td>_ Economies of scale</td>
<td>6. People will maximize their incomes, profits, or satisfaction by counting only the marginal costs and benefits of a decision.</td>
</tr>
<tr>
<td>_ Barriers to entry</td>
<td>7. A firm gets an exclusive right to provide a service, and in return the firm agrees to limit its profits and to provide service for all customers.</td>
</tr>
<tr>
<td>_ Natural monopoly</td>
<td>8. An industry in which a few sellers control the market, recognizing their mutual interdependence.</td>
</tr>
<tr>
<td>_ Patents</td>
<td>9. Past costs that should not be considered when making a current decision.</td>
</tr>
<tr>
<td>_ Franchise</td>
<td>10. Occur when the per unit costs of production decline as output increases.</td>
</tr>
</tbody>
</table>
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11. The increment in total revenue that comes when output increases by one unit.

12. Occurs when a production function displays perpetual increasing returns to scale.

13. An industry in which many firms compete fiercely by differentiating their products.

14. Any market structure that varies from the perfectly competitive case.

IV. SUMMARY AND CHAPTER OUTLINE

This section summarizes the key concepts from the chapter.

A. Patterns of Imperfect Competition
1. Imperfect competition exists in a market when firms have been able to gain some control over the price of output. Recall that, in a perfectly competitive industry, firms produce a standardized product. This, combined with the fact that they are all very small, means that firms are price-takers. Imperfect competition describes any market setting in which firms have a degree of price-setting ability. This means that instead of the perfectly elastic demand curve, imperfect competitors face a downward-sloping demand curve for their products, which have been differentiated in some way.
2. Imperfect competition takes many forms, which can be placed roughly in the following three categories:
   a. A monopoly is a single seller of a unique product.
   b. An oligopoly includes a relatively small number of sellers of a similar product; because there are just a few competitors in the industry, mutual interdependence is a critically important factor in describing the behavior of competitors.
   c. A monopolistically competitive industry has many sellers of close substitutes. Firms take their market power from downward-sloping demand curves which allow them to choose both a profit-maximizing price and quantity of output to produce.
3. Firms differentiate their products in many different ways. Some physically change the characteristics or outward appearance of their products. For example, automakers produce cars in every conceivable color, size, shape, and style, and frequently introduce new lines. Others try to change the image of their products in the minds of consumers. For example, producers of soft drinks spend millions of dollars each year to convince consumers that Coke and Pepsi taste significantly different.
   There are other ways a firm can make its product different from those of its competitors’ and create a market “niche.” Sometimes location, quality, special services, and so on, can allow firms to have greater control over price.
4. There are two primary sources of market imperfections. First, production costs and economies of scale can help to determine the size of firms in an industry. Economies of scale exist when a firm’s per unit production costs fall as output increases; this means that larger firms will have a cost advantage over smaller ones. The extent of concentration in an industry will be determined by the significance of economies of scale.
   Second, in many industries barriers to entry exist that limit the ability of new firms to compete. Legal restrictions, such as patents, franchises, and import restrictions all provide some amount of monopoly power to producers. In other cases, high entry costs exist due to the importance of advertising and the significance of reputation effects. Brand proliferation on the part of existing firms can leave little room for a new rival to further differentiate the product. All of these factors make it much more difficult for rivals to enter a market, and limit the amount of competition that exists.

B. Marginal Revenue and Monopoly
1. Because the monopolist is the only producer of a unique product, the relevant demand curve for the firm is the entire market demand curve. The position of the firm relative to the market is very different from a situation of perfect competition, where the firm is so small that it perceives its demand as being perfectly elastic.
2. Marginal revenue is defined as the addition to total revenue that comes when a firm sells an additional unit of output. Because the demand curve slopes downward for the monopolist, the market price at which all units are traded must fall in order for the firm to sell additional units of output. This means that the sale of a marginal unit increases revenues by the amount of the sale; this increase is offset to some extent because prices on all previous units must also fall. Remember that in our discussion thus far, there is a single price in the market at which all units are traded.
3. A clear relationship exists between marginal revenue, demand, and elasticity. Remember from chapter 4 that a linear, downward-sloping demand curve is elastic at the top, unit-elastic at the midpoint, and inelastic at...
the bottom. When demand is elastic, total revenue increases as prices fall, but at a decreasing rate. This means that marginal revenue is positive, but declining. When demand is unit-elastic, total revenue remains constant as prices fall. This means that marginal revenue is zero; the increase in revenue due to the marginal sale are exactly offset by the decrease in revenue due to the price cut on previous units produced. Finally, when demand is inelastic, total revenue decreases as prices fall. This means that marginal revenue is negative. Now, the increases in revenue due to the marginal sale are more than offset by the decreases in revenue due to the price cut on previous units produced. The marginal revenue curve will lie below the demand curve, and marginal revenue is always less than price.

4. The monopolist will choose the profit-maximizing level of output where marginal revenue is equal to marginal cost. This means that the firm should expand output as long as the addition to revenue is greater than the addition to costs. Given an upward-sloping marginal cost curve and a downward-sloping marginal revenue curve, once equality is reached, further increases in output will result in costs that exceed revenues at the margin. This would not be smart!

5. Since the monopolist is a price-setter, we must also determine a profit-maximizing strategy for price. The monopolist will seek to set the highest price that the market will “bear.” This price will be found by looking to the demand curve. Remember that the demand curve describes the maximum price that buyers are willing and able to pay for a particular quantity of output.

6. The perfectly competitive example can be thought of as a polar case of imperfect competition. With imperfect competition, the profit-maximizing level of output for the firm occurs where \( MR = MC \). We learned in Chapter 8 that the profit-maximizing level of output for the perfectly competitive firm occurs where \( P = MR \). However, notice that with perfect competition, \( P = MC \). The perfect competitor is a price-taker. Once the market determines the price, the firm can sell all the units it has for that price. Each time the firm sells another unit, revenues change by the market price. Thus, a general rule has been established: Any profit-maximizing firm will choose its optimal level of output where \( MC = MR \).

7. The marginal principle states that people will maximize their incomes or profits or satisfactions by counting only the marginal costs and benefits of a decision. Past, or sunk, costs can be ignored if they do not have an impact on marginal costs or benefits.

V. HELPFUL HINTS

1. Three important characteristics help to define the type of market in which a firm operates. First is the number of firms; second is the degree of product differentiation; and third is ease of entry and exit. Perfect competition and monopoly define the polar cases in each of these characteristics; other cases of imperfect competition lie somewhere between these two extremes.

2. Notice that increased international trade has increased the level and significance of competition in many markets over the past decade, even in industries whose production processes are characterized by significant economies of scale. The U.S. domestic auto industry consists of three major players, Ford, General Motors, and Chrysler. Competitive pressure from Honda, Toyota, and BMW, to name a few, has moved the industry away from the tight oligopoly structure of the mid-century and toward monopolistic competition.

3. Some students seem to feel that a monopolist can set price “anywhere,” because there are no substitutes for the product that the monopolist sells. This may seem to be the case, but note that there are very few perfectly inelastic demand curves out there. This means that quantity demanded falls when price increases, even if by just a small amount. Firms have to be sensitive to consumer demand; if consumers become too alienated, they will try harder to find substitutes or will refuse to buy altogether. Most of us consider electricity a necessity, and we purchase it from a local monopolist, albeit at a higher price than we would pay in a perfectly competitive industry. However, we can all imagine a price so high that we would use candles to light our homes, install wood-burning stoves for heat, and warm our water over our gas or wood stoves.

4. Imperfect competition does not imply the absence of competition. Rather, it implies that the extreme example of perfect competition is no longer valid. In fact, monopolistic competition describes the sorts of behaviors that most of us have come to recognize as highly competitive: lots of advertising and fierce product differentiation.

5. Next time you go to the cold cereal aisle in a U.S. supermarket, think carefully about the concept of brand proliferation. You will notice that cereal is made primarily by four producers: Kellogg, General Mills, Post, and Quaker. In fact, most stores have items grouped by brand rather than product type. That is, rather than grouping all the brands of raisin bran together on the shelf, for example, all cereals of a certain brand are shelved together. Look at the tremendous number of products made by each firm! Think about how hard this would make entry by a firm with two or three varieties of cereal, regardless of their uniqueness.
6. Tables 9-3 and 9-5 from your text illustrate the calculation of marginal revenue. Reading these tables can be tricky because marginal revenue is calculated between two points. To explain this, look at Table 9-5, which is reproduced here as Table 9-1. Notice that total revenue changes from 320 to 420 when quantity changes from 2 to 3 units (column 3); hence, marginal revenue between 2 and 3 units is 100 (column 6). Marginal revenue between 3 and 4 units is 60; hence, marginal revenue at 3 units is 80, splitting the difference between these two midpoints.

**TABLE 9-1  Summary of Firm’s Maximum Profit**

<table>
<thead>
<tr>
<th>Quantity q</th>
<th>Price P ($)</th>
<th>Total Revenue TR ($)</th>
<th>Total Cost TC ($)</th>
<th>Total Profit TP ($)</th>
<th>Marginal Revenue MR ($)</th>
<th>Marginal Cost MC ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>200</td>
<td>0</td>
<td>145</td>
<td>-145</td>
<td>+180</td>
<td>30</td>
</tr>
<tr>
<td>1</td>
<td>180</td>
<td>180</td>
<td>175</td>
<td>+5</td>
<td>+140</td>
<td>25</td>
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<tr>
<td>2</td>
<td>160</td>
<td>320</td>
<td>200</td>
<td>+120</td>
<td>+100</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>140</td>
<td>420</td>
<td>220</td>
<td>+200</td>
<td>+60</td>
<td>30</td>
</tr>
<tr>
<td>4*</td>
<td>120</td>
<td>480</td>
<td>250</td>
<td>+230</td>
<td>+40</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>100</td>
<td>500</td>
<td>300</td>
<td>+200</td>
<td>-20</td>
<td>70</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
<td>480</td>
<td>370</td>
<td>+110</td>
<td>-60</td>
<td>90</td>
</tr>
<tr>
<td>7</td>
<td>60</td>
<td>420</td>
<td>460</td>
<td>-40</td>
<td>-100</td>
<td>110</td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>320</td>
<td>570</td>
<td>-250</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Maximum-profit equilibrium

VI. MULTIPLE CHOICE QUESTIONS

These questions are organized by topic from the chapter outline. Choose the best answer from the options available.

**A. Patterns of Imperfect Competition**

1. The essential characteristic of any imperfectly competitive market is that the single firm’s:
   a. demand curve is downward-sloping.
   b. marginal revenue exceeds the price it charges.
   c. average cost curve falls over a substantial or large range of outputs.
   d. product is standardized from one firm to the next.
   e. average cost curve rises over a substantial or large range of outputs.

2. Which of the following are possible sources of imperfectly competitive markets?
   a. Declining average costs over the range of possible quantities demanded.
   b. Legal barriers to entry.
   c. Perceived product differentiation.
   d. Tariff protection from foreign competition.
   e. All of the above.

3. A firm operating in a perfectly competitive market is different from a monopoly because, among other reasons:
   a. a competitive firm can sell as much as it wishes at some given price, whereas a monopoly must lower its price if it wishes to increase the volume of its sales by any significant amount.
   b. a monopoly can always charge a price that yields a profit, whereas a competitive firm can never earn such a profit.
   c. the price elasticity of supply offered by a monopolist is higher than that offered by a competitive firm.
d. a monopolist seeks to maximize profit, whereas a competitive firm’s output decision rule equates price and average cost.
e. a monopolist deliberately seeks to operate at the minimum level of average cost, but a competitive firm does not.

4. The term *oligopoly* refers to:
   a. general rubric for imperfect competition.
   b. a situation in which the number of competing firms is large but the products differ slightly.
   c. a situation in which the number of competing firms is small but greater than one.
   d. the form of imperfect competition in which firms act like a monopoly, regardless of the number of firms or type of product.
   e. none of these.

5. Monopoly exists whenever:
   a. there is only one seller of a particular product.
   b. a seller has at least some degree of control over the price he or she can charge.
   c. the profit earned by the seller exceeds the amount that should properly be earned as interest on money invested, plus an allowance for the risk undertaken.
   d. a seller manages to maintain his or her position through successful advertising.
   e. none of these situations, necessarily.

6. Economies of scale occur whenever a firm’s:
   a. marginal cost curve shifts.
   b. total costs are rising.
   c. patents are about to run out.
   d. diminishing marginal returns have set in.
   e. per unit production costs are falling in the long run.

B. Marginal Revenue and Monopoly

7. The term *marginal revenue* refers to:
   a. the price that can be obtained for the very last unit sold.
   b. total revenue divided by the total number of units sold.
   c. total revenue minus the price received for the very last unit sold.
   d. the difference between the increase in total revenue generated by the sale of the last unit and the increase in total cost generated by the production of that unit.
   e. the difference between the increase in total revenue generated by the sale of the last unit sold and the reduction in total revenue caused by selling all the other units at a lower price.

Use Figure 9-1, which shows the current cost and demand information for a monopolist selling widgets, to answer questions 8 through 10.

![Figure 9-1](image)

8. The profit-maximizing output level for this monopolist is:
   a. 0A.
   b. 0B.
c. \(0C\).
d. \(0D\).
e. 0.

9. The profit-maximizing price for the monopolist to charge is:
   a. $1.00 per widget.
   b. $1.50 per widget.
   c. $3.00 per widget.
   d. $5.00 per widget.
   e. none of the above.

10. At the optimal level of output and price, the firm will:
   a. earn economic profits.
   b. break even, in an economic sense.
   c. make losses, but continue producing in the short run.
   d. be right at the shutdown point.
   e. shut down in the short run.

11. If a firm’s marginal revenue exceeds its marginal cost, maximum-profit rules require that the firm:
   a. increase its output in both perfect and imperfect competition.
   b. increase its output in perfect but not necessarily in imperfect competition.
   c. increase its output in imperfect but not necessarily in perfect competition.
   d. decrease its output in both perfect and imperfect competition.
   e. increase price, not output, in both perfect and imperfect competition.

12. Whenever the demand curve facing a given firm is perfectly elastic:
   a. the firm cannot be operating under conditions of perfect competition.
   b. the profit-maximizing rule which sets marginal cost equal to marginal revenue does not apply.
   c. price and marginal revenue are equal for every unit of output.
   d. price and marginal cost are equal for every unit of output.
   e. none of these conclusions is necessarily correct.

13. If a profit-maximizing monopoly has reached its equilibrium position, then price:
   a. must be less than marginal cost.
   b. must be equal to marginal cost.
   c. must be greater than marginal cost.
   d. may be equal to or below marginal cost, but not above it.
   e. none of the above is necessarily correct, since equilibrium does not require any particular relation between price and marginal cost.

14. Marginal revenue could equal price for a profit-maximizing firm:
   a. only when an industry is an oligopoly.
   b. only when an industry is a monopoly.
   c. if increased sales are associated with higher prices along a demand curve.
   d. whenever firms are able to differentiate their products and gain some control over price.
   e. only when an industry is perfectly competitive.

15. A monopolist has determined that marginal revenue is $2.00 and average cost is $1.75. It has also observed that $1.75 is the lowest sustainable average cost given current technology and input prices. To maximize profit, this firm should:
   a. increase price.
   b. decrease price.
   c. decrease output and sales.
   d. leave price and output unchanged.
   e. perhaps do any of these things; the information given is insufficient to tell.

16. Which alternative in question 15 would be correct had it specified that price rather than marginal revenue is $2.00?
   a. increase price.
   b. decrease price.
   c. decrease output and sales.
   d. leave price and output unchanged.
   e. perhaps do any of these things; the information given is insufficient to tell.

Consider the following hypothetical short-run data for Pepe’s Pizza, a local monopolist in Somewhere, USA. Pepe’s sells 8-inch cheese pies only. Please use the daily data given in Table 9-2 to answer questions 17 through 20.
TABLE 9-2

<table>
<thead>
<tr>
<th>Quantity Demanded</th>
<th>Price</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$10</td>
<td>$15</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>35</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>40</td>
</tr>
</tbody>
</table>

17. The profit-maximizing output for Pepe’s is:
   a. 0.
   b. 1.
   c. 2.
   d. 3.
   e. none of the above.

18. The profit-maximizing price for Pepe’s is
   a. $5.
   b. $6.
   c. $7.
   d. $8.
   e. none of the above.

19. Pepe’s fixed costs are:
   a. $5.
   b. $8.
   c. $10.
   d. $15.
   e. none of the above.

20. At the profit-maximizing level of output and price, Pepe’s will earn:
   a. economic profits of $21.
   b. economic profits of 0; total revenues will equal total costs.
   c. losses of $9, but Pepe’s will stay in business.
   d. losses equal to his fixed costs.
   e. none of the above; Pepe’s will be out of business, even in the short run.

21. If the price a firm obtains for its output is higher than the marginal cost associated with that particular output, then maximum-profit rules require that the firm:
   a. increase its output in both perfect and imperfect competition.
   b. increase its output in perfect but not necessarily in imperfect competition.
   c. increase its output in imperfect but not necessarily in perfect competition.
   d. decrease its output in both perfect and imperfect competition.
   e. increase price, not output, in both perfect and imperfect competition.

22. A correct statement of the relationship between marginal revenue (MR) and price elasticity of demand holds that MR is:
   a. negative when demand is inelastic.
   b. zero when demand is inelastic.
   c. positive when demand is inelastic.
   d. negative when demand displays unitary elasticity.
   e. negative when demand is perfectly elastic.

23. Jim and Tish are trying to decide whether or not to go skiing tomorrow. They have season tickets to a local ski mountain. Jim and Tish should:
   a. definitely go skiing, since they have already spent money on the season pass.
   b. ski only if the price of the pass is less than the benefit they will receive from the additional day of skiing.
   c. ski only if the marginal benefit of the day will be greater than the marginal costs of the day.
   d. not ski, since the pass has already been paid for.
   e. not ski, unless they can get a free ride and a free lunch.

5. Monopoly power results in:
5. a lower quantity than if the industry was perfectly competitive.
6. a higher price than if the industry was perfectly competitive.
7. a lower price than if the industry was perfectly competitive.
8. A and B.

VII. PROBLEM SOLVING

The following problems are designed to help you apply the concepts that you learned in this chapter.

A. Patterns of Imperfect Competition
1. There are two major sources of market imperfection.
   a. One, listed under the general rubric of “cost conditions,” can be represented graphically. Figure 9-2 illustrates three different firm cost curves along with industry demand curves. Which of the panels in Figure 9-2 illustrates relative cost circumstances that might lead to imperfectly competitive market structures? ___.
      The existence of “natural monopoly” (does / does not) fall under this classification of cost conditions; if it does, which panel illustrates natural monopoly? ___ What name should be attached to the structure suggested by panel (b)?
   b. The second rubric is entitled “barriers to entry” and incorporates a variety of situations. Indicate with (B) in the blanks provided those items in the following list that can reasonably be included in this second category:
      ___ (1) 17-year patents for new products
      ___ (2) regulated entry into an industry
      ___ (3) tariff protection from foreign competitors
      ___ (4) imaginary product differentiation
      ___ (5) deliberate overinvestment in capacity to threaten new entrants with impossibly low price competition
   c. In the case of product differentiation, the distinction between products (whether real or perceived) generates market power by moving the demand curve that the firm faces (to the left / nowhere / to the right) relative to the market demand curve for the general class of product. The result is that panel (a / b / c) of Figure 9-2 can become an appropriate representation of the firm’s individual market situation.

B. Marginal Revenue and Monopoly
2. Columns (1) and (2) in Table 9-3 represent a demand schedule. Assume that a firm has done its market research accurately so that it knows all about this schedule and can thereby identify the quantities that it can sell at various prices. This firm must operate under conditions of (perfect / imperfect) competition, since as the output to be sold increases, price (remains constant / must be reduced). In fact, assume that this firm is a monopolist, and use this data to answer the following questions:
   a. Column (3) of Table 9-3 shows total revenue. Complete the four blanks in this column. Use the figures in columns (2) and (3) to illustrate total revenue in the upper panel of Figure 9-3; i.e., show the total revenue associated with various output quantities. Join the points with a smooth curve.
b. Notice that the demand schedule becomes price-inelastic when price is sufficiently low—specifically, when price falls below ($6.00 / $5.50 / $5.00 / $4.50 / $4.00).

c. Table 9-4 shows the firm’s total cost and marginal cost for production of the commodity whose demand curve is detailed in Table 9-3. Complete the four blanks in columns (3) and (4) of Table 9-4 with the proper figures.

d. The graph of columns (1) and (2) of Table 9-4 has already been drawn in the top panel of Figure 9-3 as a total cost curve (TC). Mark the curve that you drew earlier with “TR” to distinguish it from the cost curve. Now plot the marginal cost curve (denote it “MC”) in the bottom panel of Figure 9-3.

e. Figure 9-3 is too small to indicate the precise maximum-profit position, but it is sufficient to indicate that this best possible position is approximately (45 / 65 / 85) units of output.

f. Firms often consider the impact of a marginal change in production. If the firm were to find itself operating where MR (marginal revenue) falls short of MC (marginal costs), then it should (increase / decrease) its level of production and sales. The position where MR is (less than / equal to / greater than) MC represents a balance of marginal increments; it characterizes maximum profitability.

g. Column (4) in Table 9-3 shows the extra number of units sold as prices are reduced. Column (5) shows the extra revenue (positive or negative) that results from each price reduction. Complete the blanks in these two columns.

h. Although column (5) in Table 9-3 carries extra revenue figures, these are not marginal revenue figures, since MR is a per unit concept. The top figure in column (5), for example, is $64, but it came from an increase of 7 units sold. The $64 must be divided by 7 to get the MR figure of $9.14 in column (6). Complete the missing MR figures in column (6). Plot the marginal revenue curve (denote it “MR”) in the lower panel of Figure 9-3.

### Table 9-3

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity</th>
<th>Total Revenue</th>
<th>Extra:</th>
<th>Marginal Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>$14.00</td>
<td>10</td>
<td>$140</td>
<td>7</td>
<td>$64</td>
</tr>
<tr>
<td>12.00</td>
<td>17</td>
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<td>46</td>
</tr>
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<td>10.00</td>
<td>25</td>
<td></td>
<td>11</td>
<td>29</td>
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<tr>
<td>9.00</td>
<td>31</td>
<td>279</td>
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<td>33</td>
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<td>5</td>
</tr>
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<td>11</td>
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<td>3.50</td>
<td>114</td>
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Figure 9-3
<table>
<thead>
<tr>
<th>Output</th>
<th>(1) Total Cost</th>
<th>(2) Extra Cost</th>
<th>(3) MC per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$90</td>
<td>$60</td>
<td>$12.00</td>
</tr>
<tr>
<td>5</td>
<td>150</td>
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<td>7.00</td>
</tr>
<tr>
<td>10</td>
<td>185</td>
<td>30</td>
<td>6.00</td>
</tr>
<tr>
<td>15</td>
<td>215</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>20</td>
<td>235</td>
<td>15</td>
<td>3.00</td>
</tr>
<tr>
<td>25</td>
<td>250</td>
<td>12</td>
<td>2.40</td>
</tr>
<tr>
<td>30</td>
<td>262</td>
<td>10</td>
<td>2.00</td>
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<td>280</td>
<td>6</td>
<td>1.20</td>
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<td>286</td>
<td>5</td>
<td>1.00</td>
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<tr>
<td>50</td>
<td>291</td>
<td>4</td>
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<tr>
<td>55</td>
<td>295</td>
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</tr>
<tr>
<td>60</td>
<td>300</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>65</td>
<td>308</td>
<td>10</td>
<td>2.00</td>
</tr>
<tr>
<td>70</td>
<td>318</td>
<td>12</td>
<td>2.40</td>
</tr>
<tr>
<td>75</td>
<td>330</td>
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<td>7.00</td>
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<tr>
<td>90</td>
<td>400</td>
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</tr>
</tbody>
</table>

i. The general profit-maximizing rule holds that firms expand their output until they reach the level where marginal cost equals marginal revenue. The approximate profit-maximizing level of output, using your diagram of marginal revenue and marginal cost, is ___.

j. To sell this output, the firm would charge a price of about ($7.00 / $5.75 / $4.00 / $1.60). Its total revenue would be roughly ($380 / $580 / $780). Total cost would be roughly ($310 / $510 / $710), leaving profit per period of about $70.
3. Figure 9-4 shows the per unit cost and revenue measures confronting a monopolist. The $DD$ line is the market demand curve. $MR$ is the corresponding market marginal revenue curve. $AC$ is the firm’s average cost curve, and $MC$ represents the corresponding marginal cost schedule.
   a. If output is 4, what must price be? 
   b. What is marginal revenue at 4 units of output? 
   c. At what level of output does average cost fall to its minimum level? 
   d. What price would clear the market if output were set at this minimum $AC$ level? 
   e. What would total cost be at this level? 
   f. What would total revenue be? 
   g. What would profit be? 
   h. At what output would profit be maximized? 
   i. What is marginal revenue at this output? 
   j. What is marginal cost at this output? 
   k. What is average cost at this output? (Assume it is 20 cents above minimum level.) 
   l. What is price at this output? 
   m. What is total profit at this output? 

4. Consider another profit-maximizing-consultant problem, like the one you completed in Chapter 8. What would you recommend in each of the seven cases listed in Table 9-5? In each case, the firm in question is a monopoly and wants to maximize its profits (or minimize its losses). Enough information is supplied in each case, though you may have to fill in some of the blank spaces in the table to do your job. (Hint: There is at least one “nonsense case,” in which the figures are inconsistent and cannot be correct. Ferreting out such a circumstance could lead you to tell your client to do a better job in picturing either his or her market or cost structure.)

   Answer for each case by putting one of the numbers 1 through 5 from the code list below into the extreme right-hand column of the table. (The same number may of course be used for more than one question.)
   1 = Firm is now at correct position.
   2 = Firm should increase price and reduce quantity produced and sold.
   3 = Firm should reduce price and increase quantity produced and sold.
   4 = Firm should shut down operations because loss at best possible operating position exceeds fixed cost.
   5 = A nonsense case—the figures supplied are inconsistent and could not all be correct.
TABLE 9-5

<table>
<thead>
<tr>
<th>Case</th>
<th>Price</th>
<th>Marginal Revenue</th>
<th>Quantity of Output</th>
<th>Total Revenue</th>
<th>Total Cost</th>
<th>Fixed Cost</th>
<th>Average Cost</th>
<th>Marginal Cost</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>$8.00</td>
<td>$4.00</td>
<td>2,000</td>
<td></td>
<td>$4,000</td>
<td>$2,000</td>
<td>At minimum level 1.80</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>5.00</td>
<td>4.00</td>
<td>1,000</td>
<td>$8,000</td>
<td>3,000</td>
<td>1,000</td>
<td>2.00</td>
<td>2.00</td>
<td>$3.00</td>
</tr>
<tr>
<td>c.</td>
<td>8.00</td>
<td>zero</td>
<td>4,000</td>
<td>$32,000</td>
<td>6,000</td>
<td>2,000</td>
<td>2.00</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>1.00</td>
<td>2.00</td>
<td>10,000</td>
<td></td>
<td>4,000</td>
<td>2,000</td>
<td>At minimum level 3.00</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>3.00</td>
<td>2.00</td>
<td>32,000</td>
<td></td>
<td>5,000</td>
<td>2,000</td>
<td>2.00</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td>2.50</td>
<td>2.00</td>
<td>10,000</td>
<td></td>
<td>6,000</td>
<td>2,000</td>
<td>2.00</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>g.</td>
<td>2.50</td>
<td>2.00</td>
<td>10,000</td>
<td></td>
<td>6,000</td>
<td>2,000</td>
<td>2.00</td>
<td>2.00</td>
<td></td>
</tr>
</tbody>
</table>

5. In the section of the text headed “Let Bygones Be Bygones,” it is emphasized that a firm, in setting output and price according to $MR = MC$, will disregard fixed cost. This does not mean that fixed cost can be ignored completely; maximum profits could be negative, for example, if fixed costs were too large. Nonetheless, in the determination of the profit-maximizing production/sales point, marginal revenue and marginal cost are the critical parameters.

   a. Suppose that a monopolist’s fixed costs increase, perhaps because a flat tax is levied against the firm’s property. Would this tax raise the firm’s AC curve? (yes / no)

   b. Would the tax affect the monopolist’s variable cost, or the AVC curve? (yes / no)

   c. Would the tax affect the monopolist’s marginal cost curve? (yes / no)

   d. If the MC curve were unaffected, should such a flat tax change the maximum-profit output? (Presumably the tax would not affect output demand, so it would have no effect on marginal revenue.) (yes / no / no, unless the firm is forced out of business)

   e. If the tax did not affect MC, MR, or maximum-profit output, would the price be changed? (yes / no)

VIII. DISCUSSION QUESTIONS

Answer the following questions, making sure that you can explain the work you did to arrive at the answers.

1. List the continuum of industrial structures from perfectly competitive at one extreme to monopoly at the other. List examples of industries in the “real world” that you believe fit into these categories, and support your categorizations with evidence from the chapter. (Use examples other than those cited in your textbook.)

2. Table 9-2 in your textbook cites beer brewing as an industry in which significant economies of scale affect the production process and cost structure. Given these data, how can you explain the tremendous success of “microbreweries” (small, regional breweries) in the past decade? What has changed to allow these smaller firms to flourish?

3. Explain in your own words why the marginal revenue curve is downward-sloping, and why marginal revenue is less than price for each quantity of output.

4. Mr. Jones says, “If a firm does not produce at minimum average total cost in the long run, it will go out of business.” Is this true for a monopolist? What factors exist to dampen the ability of a monopolist to extract ever higher profits?

5. OPEC, the international oil cartel, had a near monopoly on the world supply of oil in 1972. What demand-side factors led to the dissolution of this monopoly position? What supply-side factors led to the dissolution of this monopoly position?

6. Will a monopolist ever operate in the inelastic portion of the demand curve?

IX. ANSWERS TO STUDY GUIDE QUESTIONS

III. Review of Key Concepts

14 Imperfect competition
4 Monopoly
8 Oligopoly
13 Monopolistic competition
2 Product differentiation
10 Economies of scale
3 Barriers to entry
12 Natural monopoly
VI. Multiple Choice Questions

<p>| | | | | | | |</p>
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<td>E</td>
<td>3</td>
<td>A</td>
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<td>E</td>
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<td>A</td>
<td>9</td>
<td>D</td>
<td>10</td>
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<td>C</td>
<td>14</td>
<td>E</td>
<td>15</td>
<td>B</td>
<td>16</td>
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<td>19</td>
<td>D</td>
<td>20</td>
<td>C</td>
<td>21</td>
<td>B</td>
<td>22</td>
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</tbody>
</table>

VII. Problem Solving

1. a. A, does, A, oligopoly
   b. (1) B
      (2) B
      (3) B
      (4) B
      (5) B
   c. to the right, A
2. imperfect, must be reduced
   a. column 3 = $250, $350, $400, $404. See top panel of Figure 9-3.
   b. $4.50
   c. column 3 = $20, $8 column 4 = $4, $1.60
   d. See bottom panel of Figure 9-3.
   e. 65
   f. decrease, equal to
   g. column 4 = 6, 6, 9, 13
      column 5 = $38, $9, -$1.
   h. column 6 = $4.56, $2.33, $1.00. See bottom panel of Figure 9-3.
   i. 65
   j. $5.75, $380, $310
3. a. $7.00
   b. $6.00
   c. 5 units
   d. $6.75
   e. $20.00
   f. $33.75
   g. $13.75
   h. 6 units
   i. $5.00
   j. $5.00
   k. $4.20
   l. $6.50
   m. $13.80
4. a. $MR>MC$ means output should be increased; price will have to be reduced. Answer: 3.
   b. $AC$ at a minimum means that $AC = MC$, in this case $AC = $4.00, and is equal to $MR$. Answer: 1.
   c. Price = $TR/Q = $2.00$. Since $MR<P$, output should be reduced to make $MR$ equal to $MC$. Answer: 2.
   d. $MC>MR$, so output should be reduced. This firm is now maximizing revenue, not profit. Answer: 2.
   e. $MR$ cannot exceed price. Answer: 5.
   f. $AC = TC/Q = $3.00$. Since $3.00 = P>MR$, it must be that $MR<MC$. Answer: 2.
   g. $MR = MC$, so profit is maximum, but it is negative. $TR = $2.50 x 10,000 = $25,000<TC = AC x Q = $30,000. Answer: 4.
5. a. yes
   b. no
   c. no
   d. no, unless the firm is forced out of business
   e. no
VIII. Discussion Questions
1. Perfect competition > monopolistic competition > oligopoly > monopoly. Industries like agriculture and textiles might be perfectly competitive (without the government policies that affect these markets); industries like fast food and retail might be monopolistically competitive; industries like autos and steel might be oligopolistic; and industries like natural gas and electricity might be monopolistic.
2. These small firms have been able to significantly differentiate their products and to convince consumers that their products are better than those produced by large firms. Changes in tastes and preferences among consumers have led to the success of these small breweries.
3. The marginal revenue curve is downward-sloping because firms with monopoly power must lower price in order to sell additional units of output. Since there is a single market price, the monopolist must decrease price on all preceding units sold in order to lure additional buyers into the market. Thus, marginal revenue is always less than price.
4. No this is not true for a monopolist. There are no competitive factors, or competitive pressures from potential entrants, that force the firm to produce with minimum average costs, even in the long run.
5. Demand decreased due to changes in consumer behavior in many countries. Demand also became more elastic, as consumers had time to search for and develop suitable substitutes for oil-based products. On the supply side, the existence of economic profits for OPEC lured entrants into the market. Oil was discovered in the North Sea, in Mexico, and in Alaska; these new discoveries increased the worldwide supply of oil and eroded OPEC’s monopoly power.
6. No. Since marginal revenue is negative in the inelastic portion of the demand curve, when a monopolist sets $MR = MC$ the profit maximizing point is never in the inelastic region. Marginal cost is never negative.