MICROECONOMICS: UNIT III

# COST OF PRODUCTION & THEORY OF THE FIRM

One of the concepts mentioned in both Units I and II was **profit** and its components, **total cost** and **total revenue**. In this unit, costs and revenue will be explored in more detail, and then graphed to show relationships. The goal is to find the profit-maximizing output for a variety of market structures. What does that mean? It means, how does a company know what price to charge and what quantity to produce? It produces at the profit-maximizing output, of course!

In Unit I, we organized an ice cream factory according to the factors of production. This time, let's separate it according to types of costs. Look at the examples and try to predict the definition of each type of cost.

To review: **total revenue** is calculated by multiplying price and quantity. Calculating revenue means little, though, without comparing it to costs. **Total cost** is found by multiplying cost per unit and quantity.

Total Cost can be calculated this way, as well; Fixed Cost plus Variable Cost, or **TC = FC + VC**.

| **Type of cost:** | **Examples of factor/resource/ input costs for an ice cream factory:** | **Definition:** |
|---|---|---|
| **Variable Cost** | cream, fruit, chocolate, nuts, sugar, advertising expenses, workers' wages, shipping charges, electricity, etc. | Costs that change according to the amount produced – if more ice cream is produced, more of these variable resources will be needed. |
| **Fixed Cost** | factory, freezers, mixing bowls, insurance, real estate taxes, executive salaries, etc. | Costs that are fixed regardless of the amount produced – if a lot of ice cream is produced, these costs will stay the same; if no ice cream is produced, these costs will stay the same. |

Often, it is more important to find out the average cost per unit produced. Finding an average is simply dividing by quantity:

**Average Fixed Cost** ("AFC") = **FC/Q**
**Average Variable Cost** ("AVC") = **VC/Q**
**Average Total Cost** ("ATC") = **TC/Q or AFC+AVC**

In order to see the relationships between these costs, it helps to fill out a table. See if you can do it:

| Output (or Quantity) | Fixed Cost | Variable Cost | Total Cost | Average Fixed Cost | Average Variable Cost | Average Total Cost |
|---|---|---|---|---|---|---|
| 0 | | 0 | $10.00 | | | |
| 1 | | $10.00 | | | | |
| 2 | | 17.5 | | | | |
| 3 | | 22.5 | | | | |
| 4 | | 25 | | | | |
| 5 | | 26 | | | | |
| 6 | | 27.5 | | | | |
| 7 | | 32.5 | | | | |
| 8 | | 40 | | | | |
| 9 | | 50 | | | | |
| 10 | | 70 | | | | |

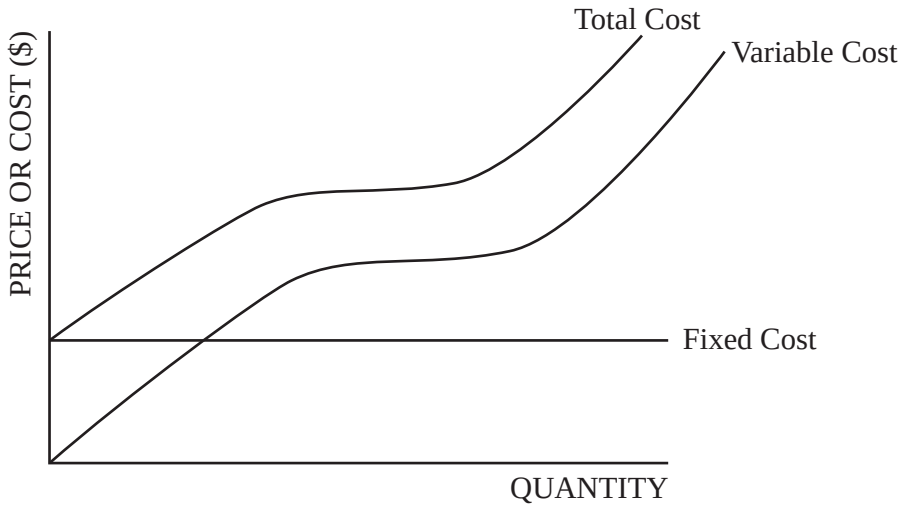
Here are the answers. Refer back to the formulas in the previous paragraphs if you are unsure as to how to calculate the numbers.

| Output (or Quantity) | Fixed Cost | Variable Cost | Total Cost | Average Fixed Cost | Average Variable Cost | Average Total Cost |
|---|---|---|---|---|---|---|
| 0 | $10.00 | $0.00 | $10.00 | $0.00 | $0.00 | $0.00 |
| 1 | 10 | $10.00 | 20 | $10.00 | $10.00 | $20.00 |
| 2 | 10 | 17.5 | 27.5 | 5 | 8.75 | 13.75 |
| 3 | 10 | 22.5 | 32.5 | 3.33 | 7.5 | 10.83 |
| 4 | 10 | 25 | 35 | 2.5 | 6.25 | 8.75 |
| 5 | 10 | 26 | 36 | 2 | 5.2 | 7.2 |
| 6 | 10 | 27.5 | 37.5 | 1.66 | 4.58 | 6.25 |
| 7 | 10 | 32.5 | 42.5 | 1.42 | 4.64 | 6.07 |
| 8 | 10 | 40 | 50 | 1.25 | 5 | 6.25 |
| 9 | 10 | 50 | 60 | 1.11 | 5.55 | 6.66 |
| 10 | 10 | 70 | 80 | 1 | 7 | 8 |

**Important concepts to recognize:**

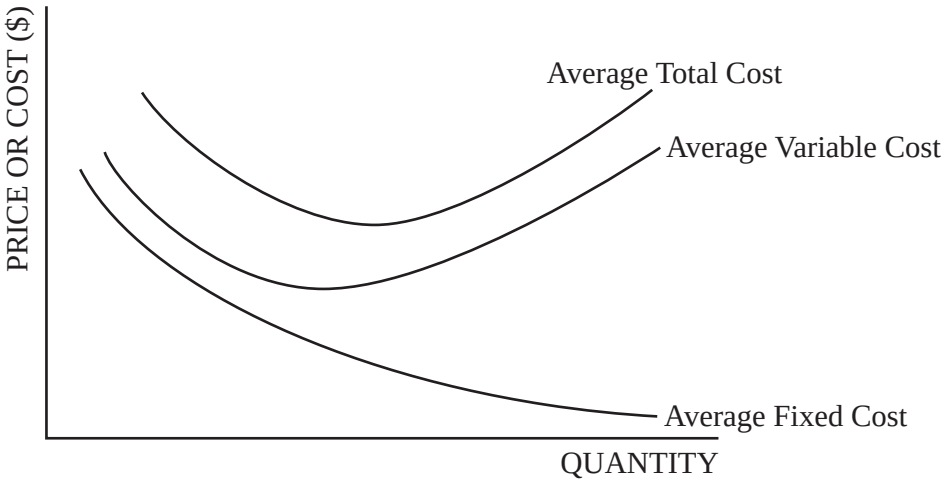
1) Fixed costs stay the same regardless of the quantity produced.
2) Variable costs increase as quantity produced increases.
3) Total costs increase as quantity produced increases.
4) The difference between total cost and variable cost is always fixed cost.

It is easier to see these relationships on a graph. Plotting the points using quantity on the X axis and price or cost on the Y axis, you will see the shaded data above drawn as cost curves on *Graph A.*




*Graph A: Cost Curves*

Plotting the numbers from the remainder of the chart (the non-shaded part) using quantity on the X axis and price on the Y axis, you will see the following cost curves:




*Graph B: Average Cost Curves*

**Some more important concepts to recognize:**

5) Average fixed costs become increasingly smaller as quantity increases, but never reach zero.
6) Average variable costs grow smaller, then larger.
7) Average total costs grow smaller, then larger.
8) The difference between average total costs and average variable costs starts out large, but grows smaller as quantity produced increases; this difference is the average fixed cost.
9) The AVC and ATC curves are u-shaped due to diminishing marginal returns.

Regardless of the numbers used, the curves in *Graphs A* and *B* will always have the same shapes and relationships.

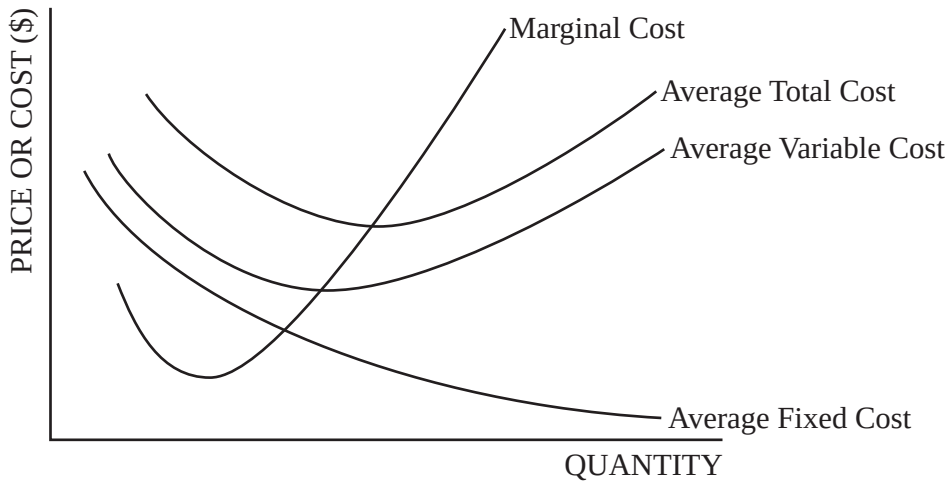
There is another cost that needs to be included in the chart for it to be complete. **Marginal Cost** (or MC) is the additional cost that is incurred by producing an additional unit. It is calculated by dividing the change in total cost by the change in quantity, or

$$\mathbf{MC} = \frac{\Delta \mathbf{TC}}{\Delta \mathbf{Q}}$$

Using the table on page 65, if we add a column for marginal cost, it would look like this:

| Output (or Quantity) | Fixed Cost | Variable Cost | Total Cost | Average Fixed Cost | Average Variable Cost | Average Total Cost | Marginal Cost |
|---|---|---|---|---|---|---|---|
| 0 | $10.00 | $0.00 | $10.00 | $0.00 | $0.00 | $0.00 | $0.00 |
| 1 | 10 | $10.00 | 20 | $10.00 | $10.00 | $20.00 | 10 |
| 2 | 10 | 17.5 | 27.5 | 5 | 8.75 | 13.75 | 7.5 |
| 3 | 10 | 22.5 | 32.5 | 3.33 | 7.5 | 10.83 | 5 |
| 4 | 10 | 25 | 35 | 2.5 | 6.25 | 8.75 | 2.5 |
| 5 | 10 | 26 | 36 | 2 | 5.2 | 7.2 | 1 |
| 6 | 10 | 27.5 | 37.5 | 1.66 | 4.58 | 6.25 | 1.5 |
| 7 | 10 | 32.5 | 42.5 | 1.42 | 4.64 | 6.07 | 5 |
| 8 | 10 | 40 | 50 | 1.25 | 5 | 6.25 | 7.5 |
| 9 | 10 | 50 | 60 | 1.11 | 5.55 | 6.66 | 10 |
| 10 | 10 | 70 | 80 | 1 | 7 | 8 | 20 |

Again, here is *Graph B* but now with the MC curve included:




*Graph C: Average Costs and Marginal Cost*

## Additional important concepts to recognize:

10) Marginal cost reflects the change in cost between the current unit and the previous unit. For example, producing a second unit costs an additional $7.50, while adding the third unit costs an additional $5.00.
11) The MC curve starts high, then drops to a minimum before increasing again.
12) The MC curve always intersects the AVC and ATC curves at their lowest points.
13) Because MC reflects a *change* in the cost schedules, MC is only affected by variable cost; fixed cost plays no role in calculating MC. To prove this, change the fixed cost number in the table about to $20.00 and re-calculate MC. What happens? Your marginal cost is still the same.

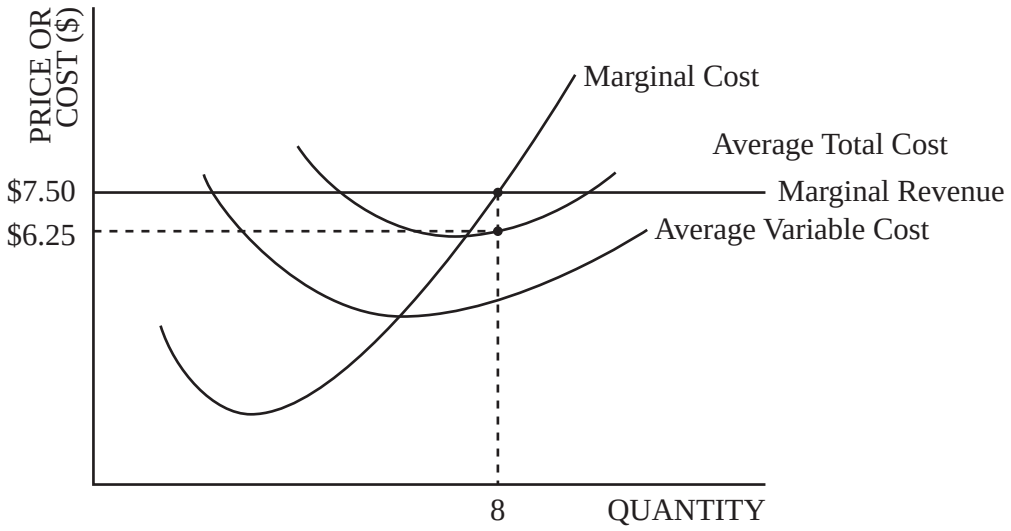
Why is marginal cost important? A smart producer wants to know exactly how much it costs to produce each unit of output. That way, he can determine the exact point when he should cease production: that moment when the benefit of producing (the marginal benefit, or MB) is less than the cost (the marginal cost, or MC). Using the idea of marginal analysis from Unit I, marginal cost reflects the **diminishing returns** obtained from adding variable costs to at least one, if not more, fixed costs. Translated, this means that as another worker is added to the ice cream factory, eventually the cost to hire that worker outweighs the benefit of his output. The factory is only so big and there is only so much machinery that can be used at one time (economists call this "fixed capital stock"). When marginal benefits are less than marginal costs, production needs to decrease (and perhaps workers are laid off) until the point where marginal benefits again equal marginal costs.

In order to determine where **MB = MC**, we need to find MB. Considering the production of ice cream, the benefit for the producer is the revenue he receives from selling ice cream. **Marginal Revenue** (or MR) is the additional revenue he receives for selling an additional unit of ice cream, or

$$\mathbf{MR} = \frac{\Delta \mathbf{TR}}{\Delta \mathbf{Q}} \text{ or } \frac{\Delta (\mathbf{P} \times \mathbf{Q})}{\Delta \mathbf{Q}}$$

Assume the ice cream producer sells his ice cream in large containers for $7.50 apiece. Thus, using the above formula, his MR for each unit is also $7.50.

As stated earlier, costs and revenues by themselves do not mean much. We need to have both revenue and cost information in one place in order to compare. We do this by plotting MR on *Graph D*. The plotted line is horizontal because the factory can sell as much ice cream as it can produce at $7.50 per container.




*Graph D: Profit-maximizing Output*

Notice that MC and MR intersect at a price of $7.50 and a quantity of 8. This intersection is one of the most important relationships in Microeconomics: economists call it the **profit-maximizing output** (do you hear the fireworks exploding? That's how important this concept is.) This is the quantity the producer should produce – no more, no less. If she produces less, where MR>MC, she will be leaving potential revenue on the table by not selling as many containers of ice cream as possible. If she sells more, where MR<MC, well, that

is never a good thing. No one wants costs to be greater than revenue, neither in the short-run nor the long-run. Thus, MR=MC is the best possible place to produce.

**Profit** (or total revenue – total cost), can be determined at the profit-maximizing output by calculating it one of two ways:

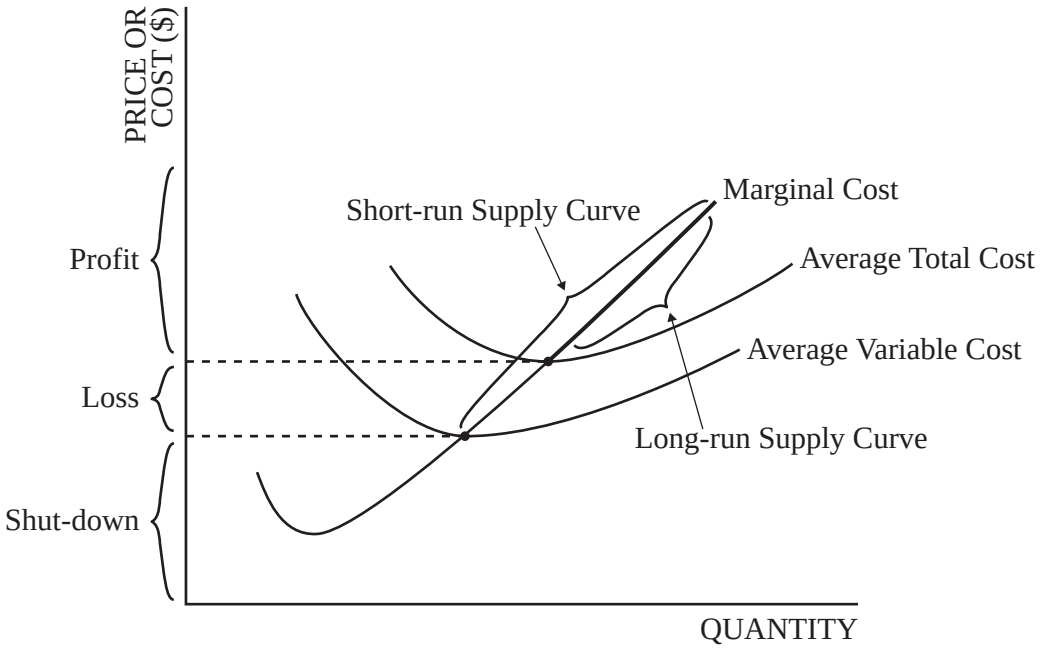
$(P \times Q) - (ATC \times Q) = (\$7.50 \times 8 \text{ units}) - (\$6.25 \times 8 \text{ units}) = \$60 - \$50 = \$10$

or

$\$7.50 - \$6.25 = \$1.25$ per unit profit; $\$1.25 \times 8$ units $= \$10$

If the price of ice cream – the MR – falls below $6.07 but stays above $4.64, that is, between the AVC and the ATC curves respectively (if you are unsure where these numbers come from, refer back to the table on page 67), then the producer is losing money in the short-run. That means she can stay in business for a short while, perhaps by dipping into her savings, but eventually her savings will run out. She also could try to cut costs by laying off workers or paying less for her factors of production. However, unless prices rise or costs fall, she will not be able to sustain her business in the long-run.

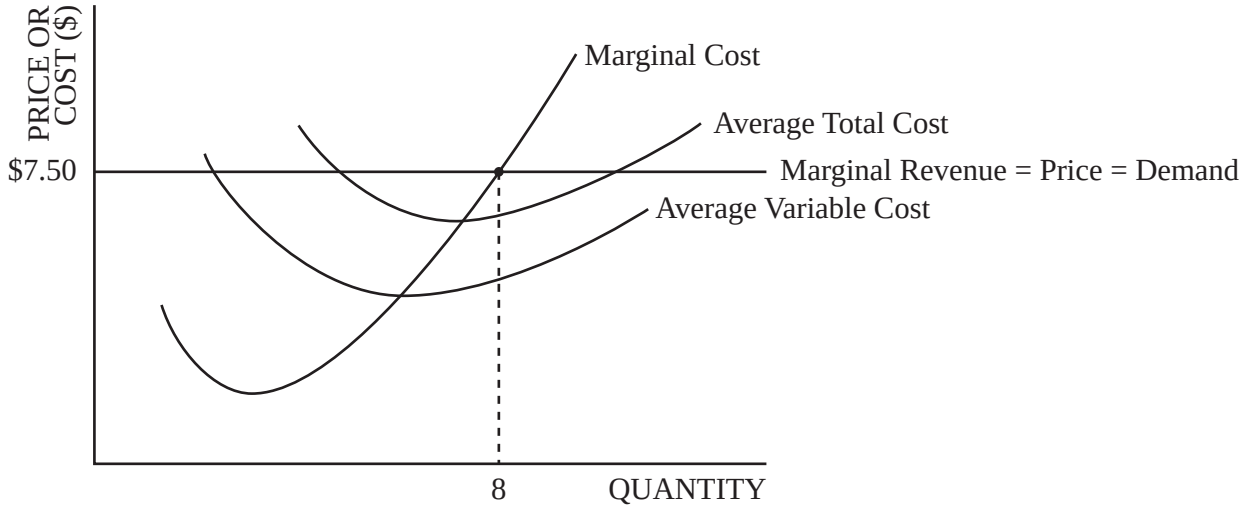
If prices fall even further, say below $4.64 – below the AVC curve – she will have to shut down production, as she can no longer cover even her fixed costs, those she has to pay regardless of how much she produces.




*Graph E*

And if prices rise? Her profits will grow (assuming costs do not change) and she will be one happy entrepreneur.

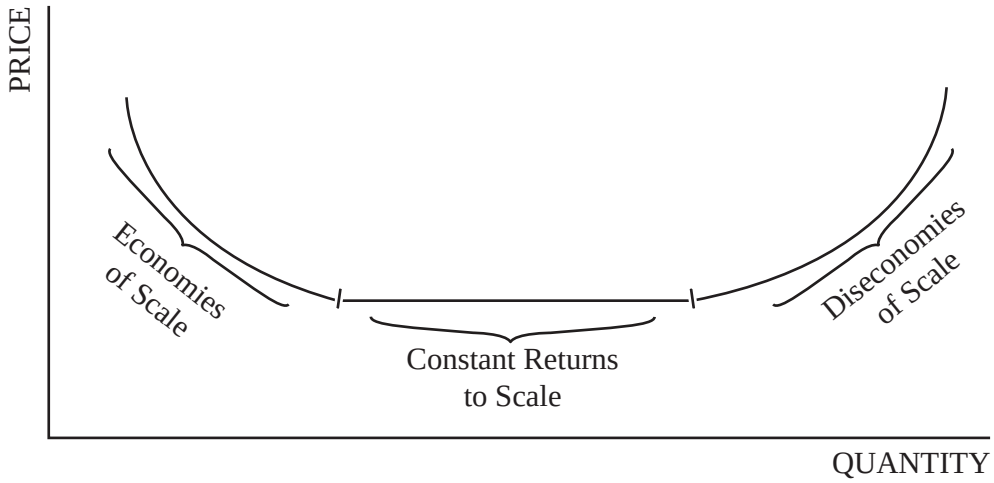
Notice in the previous examples we determined the cut-off points by looking at where the MC crossed the ATC and AVC curves (their lowest points). These points are important not only because they determine the points where the producer loses money in the short-run or shuts down production, but also because they determine the producer's supply curve. As the producer will not produce below the point where MC = AVC, the **firm's short-run supply curve** is that part of the MC curve above AVC. The **firm's demand curve** is the MR curve. As long as she charges this price, buyers will buy as much of her output as she is willing to sell.




*Graph F: Firm's Supply and Demand*

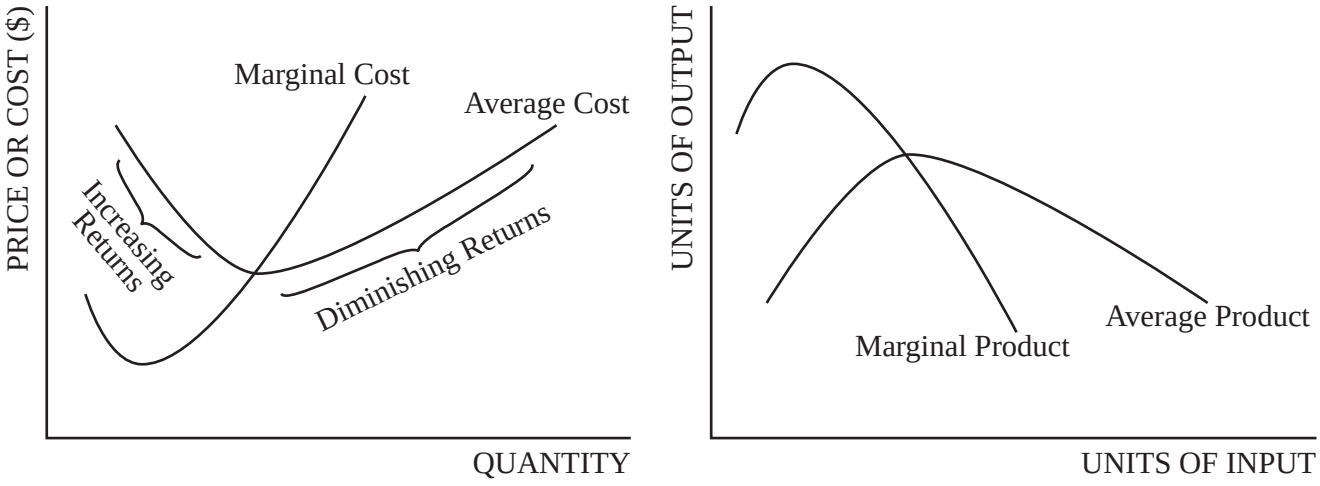
**Even more important concepts to recognize:**

14) In the long-run, average total cost is usually designated as **long-run average cost**, or LRAC. This is to distinguish it from the short-run, when costs are both fixed and variable. In the long run, all costs are variable, as the long-run represents that time when everything is changeable – leases can be renegotiated, orders can be changed, new equipment can be purchased, etc. The short-run, if you remember from Unit I, is that period where at least one factor of production is fixed.
15) Long-run cost curves are the sum of many short-run cost curves. The long-run curve has three distinct parts: that part where costs are falling due to **economies of scale**, that part where costs are constant ("**constant returns to scale**"), and that part where costs are rising due to **diseconomies of scale**. *Graph G* shows this concept.




*Graph G: Long-Run Average Cost*

16) In the long-run, the point where MC = MR takes on new meaning. Unlike in the short-run where production can continue temporarily if a business is losing money, in the long-run, if MR falls below ATC, the company will go out of business. Thus, the firm's supply curve is that part of the MR curve above ATC. Since a producer cannot lose money in the long run, his **long-run supply curve** is that part of the MC curve where profits are always earned (see *Graph E*).
17) Cost curves are mirror images of product curves. In economic vocabulary, "product" means output. Due to increasing returns, costs fall as production increases, but only up to a point. Eventually, due to diminishing returns, costs will increase and production will fall. This is reflected in the production curve by the fact that output increases as workers become more experienced and specialization takes place. Eventually those benefits are exhausted, and production decreases. *Graph H* shows this relationship.




*Graph H: Cost Curves and Product Curves*

The previous information is useful for all types of businesses, not just ice cream factories. Economists categorize businesses into four market structures. Each market structure has its own set of characteristics, as shown in the following chart:

| Market Structure Characteristic: | Perfect Competition | Monopolistic Competition | Oligopoly | Monopoly |
|---|---|---|---|---|
| **Example** | agricultural products | retail stores, restaurants | phone companies, airlines, car makers | utilities |
| **Type of product** | homogeneous | differentiated | differentiated or homogeneous | unique |
| **Number of firms in the market/ industry** | thousands | hundreds | 2 to 100 | 1 |
| **Percentage of market share** | very small | small to large | large enough for market power | 100.00% |
| **Barriers to entry** | none | some | many | many |
| **Non-price competition** | no | yes | yes | no |
| **Number of substitutes** | infinite | many | few | none |
| **Slope of the demand curve** | perfectly elastic (horizontal) | relatively inelastic (downward sloping) | not applicable | more inelastic (downward sloping) |
| **Profit-maximizing price** | P = MC = MR | P > MC = MR | not applicable | P > MC = MR |
| **Price is determined by _____** | the market ("price-taker") | the firm ("price-maker") | the firm ("price-maker") | the firm ("price-maker") |
| **Long-run economic profits** | zero | zero | yes | yes |
| **Relationship between MR and D curves** | MR = D | MR < D | not applicable | MR < D (except price-discriminating monopoly, where MR = D) |
| **Consumer and producer surplus** | at their maximums and equal | producer surplus > consumer surplus | not applicable | producer surplus > consumer surplus; (no consumer surplus in price-discriminating monopoly) |

| | | | | |
|---|---|---|---|---|
| **Deadweight loss** | none | yes | not applicable | yes (except price-discriminating monopoly) |
| **Productive efficiency (P = minimum ATC)** | yes | no | no | no |
| **Allocative efficiency (P = MC)** | yes | no | no | (except price-discriminating monopoly) |

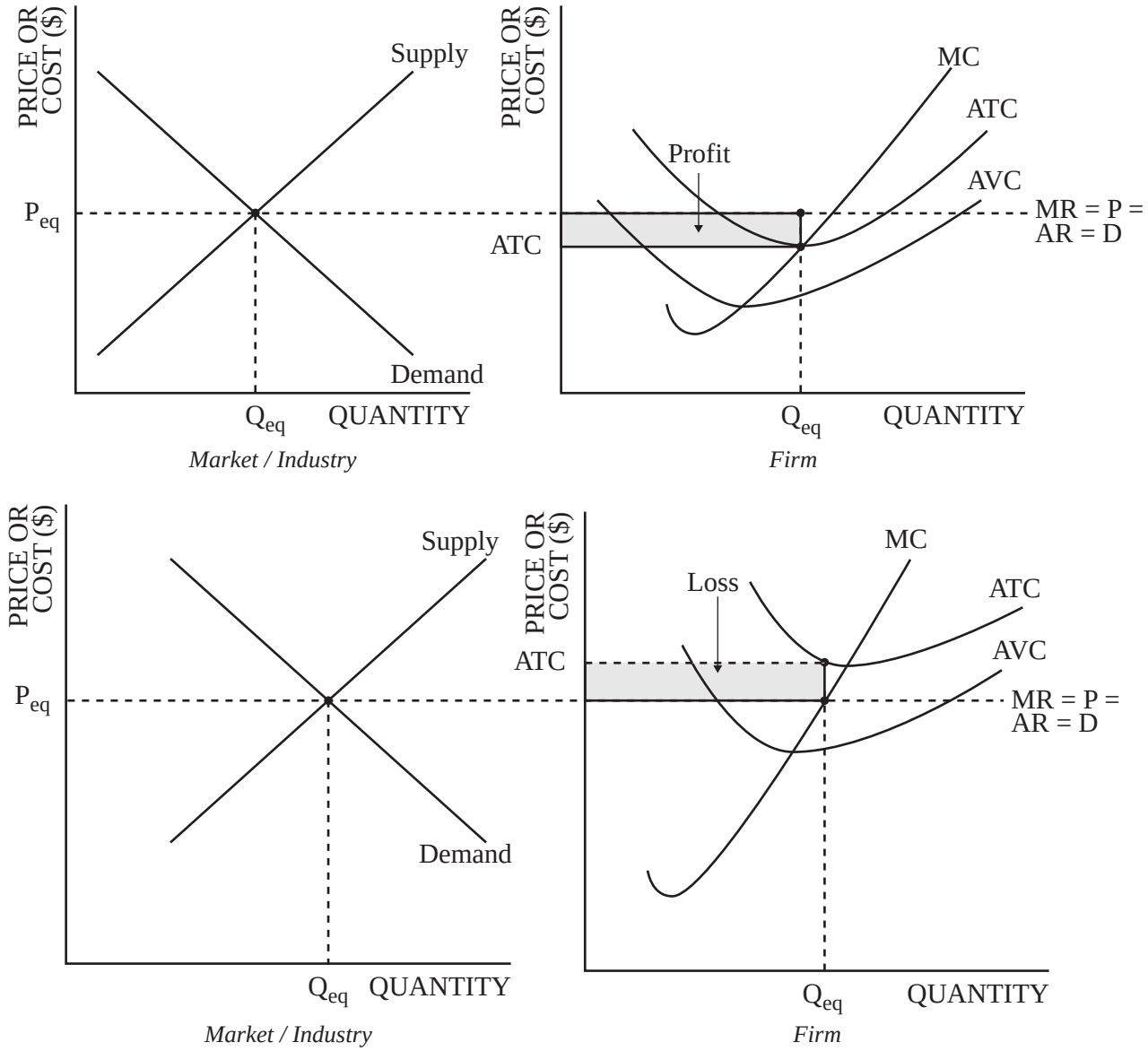
What does all of this mean?

First, notice that perfect competition and monopoly are at two ends of the spectrum, and that monopolistic competition and oligopoly fall somewhere in between.

Second, each of these market structures has a graph (except oligopoly) that helps describe and explain it.

## Perfect Competition

The set of graphs for perfect competition should look familiar:




*Graph I: Perfect Competition in the Short-Run*

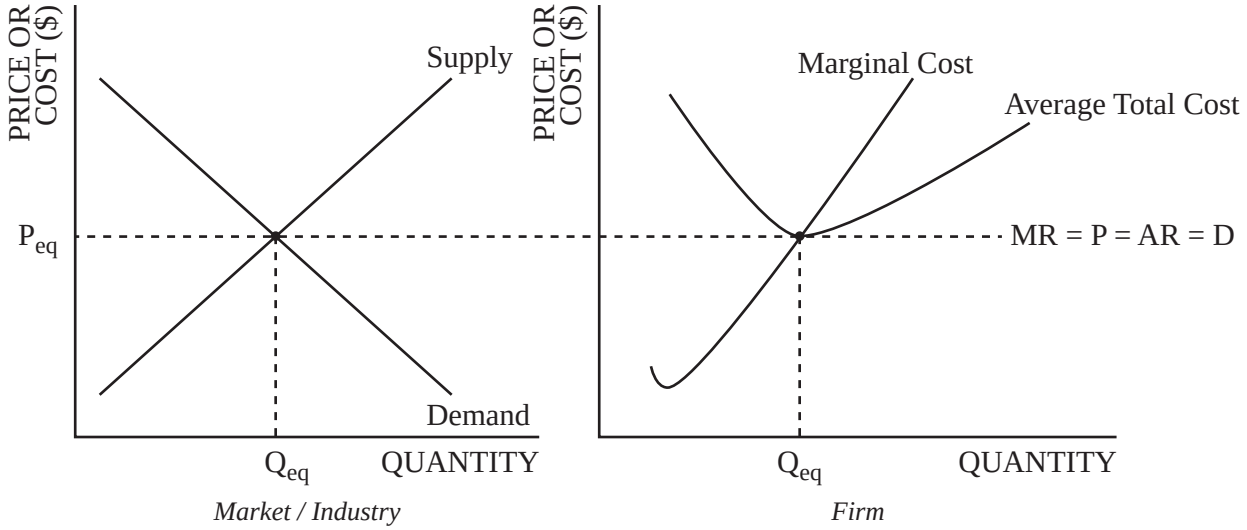
It is the combination of two graphs already discussed: the supply and demand graph from Unit II and the cost curves graph discussed previously in this unit. The supply and demand graph illustrates the market; the cost curves graph illustrates an individual firm (one of thousands) in this market. The price and quantity equilibrium in the market graph determines the price this individual firm and all others must charge, as the firms are price takers. Each firm's influence in the marketplace is so small that it must take the market price or risk pricing itself out of the market, since other firms produce homogeneous products that are perfectly substitutable. Consumers will be quick to purchase goods from other firms if the product is not priced correctly.

The concept of perfect substitutability is an important one because it defines the types of goods sold in a perfectly competitive market. The best examples are agricultural products, as it is difficult to determine the difference between one firm's output and another's. One farmer's ear of corn is indistinguishable from another's – they are homogeneous. Thus, the demand curve is perfectly elastic.

For perfect competition, D = P = AR = MR because:

| Quantity | Price | Total Revenue | Average Revenue | Marginal Revenue |
|---|---|---|---|---|
| | | TR = P x Q | AR = TR/Q | MR = ΔTR/ΔQ |
| 0 | $2.00 | 0 | 0 | 0 |
| 1 | 2 | 2 | 2 | 2 |
| 2 | 2 | 4 | 2 | 2 |
| 3 | 2 | 6 | 2 | 2 |
| 4 | 2 | 8 | 2 | 2 |

As supply and demand shift according to their respective determinants in the market, the firm's demand curve changes as well. Prices go up, prices come down, and firms enter and exit the market accordingly. This entry and exit stops as the market finds its long-run equilibrium, that point at which economic profits are zero and the firm is both allocatively and productively efficient. Because the existence of these efficiencies means that the market is now economically efficient, perfect competition is considered the ideal market structure. Consumer and producer surpluses are at their maximum, and deadweight loss does not exist.



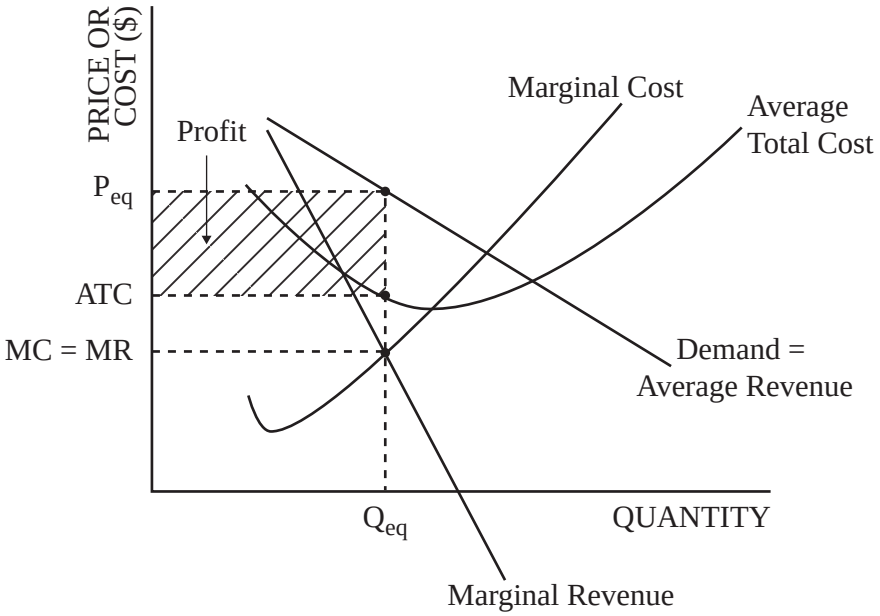

*Graph J: Perfect Competition in Long-Run Equilibrium*

## Monopoly

The opposite of this perfection is monopoly. A firm that is a monopoly faces no competition due to the existence of **barriers to entry**. Since perfectly competitive firms make up such a small part of the market, these firms are not able to keep other competitors from joining the market. If a person wants to become a

farmer, all he/she needs to do is plant some seeds. On the other hand, those firms that control a large portion of the marketplace generally do so because they benefit from these barriers that keep other firms out, thus lessening competition. Examples of barriers to entry are economies of scale, control over natural resources, legal barriers such as patents and licenses, pricing strategies such as underbidding or dumping, brand loyalty, mergers and/or takeovers, and the ability to conduct research and development.

The result of this lack of competition is that a monopoly is able to charge a price greater than MC = MR, as shown in *Graph K*.




*Graph K: Monopoly*

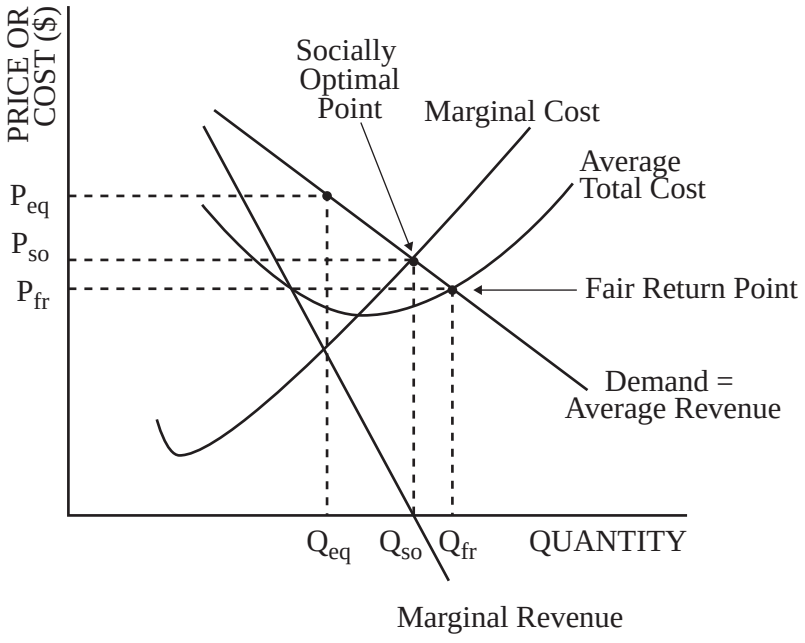
Notice that profit is determined the same way as in perfect competition and that the cost curves are the same shape. However, there are some important differences between the graphs of the two market structures.

1) For a monopoly, the demand and marginal revenue curves are downward sloping, as opposed to horizontal for a perfectly competitive firm. This is due to the fact that there are fewer substitutes for a monopoly's product, and thus the curves are more inelastic. The result of this is that if the monopoly wants to sell a greater quantity than the profit-maximizing output, the monopolist will have to lower his price. This is shown in the price column of the table on the next page.
2) Unlike in perfect competition, the demand and marginal revenue curves are separate, and the marginal revenue curve has a steeper slope than the demand curve. This is proven mathematically in the table on the next page.

For monopoly, D = AR = P but is > MR because:

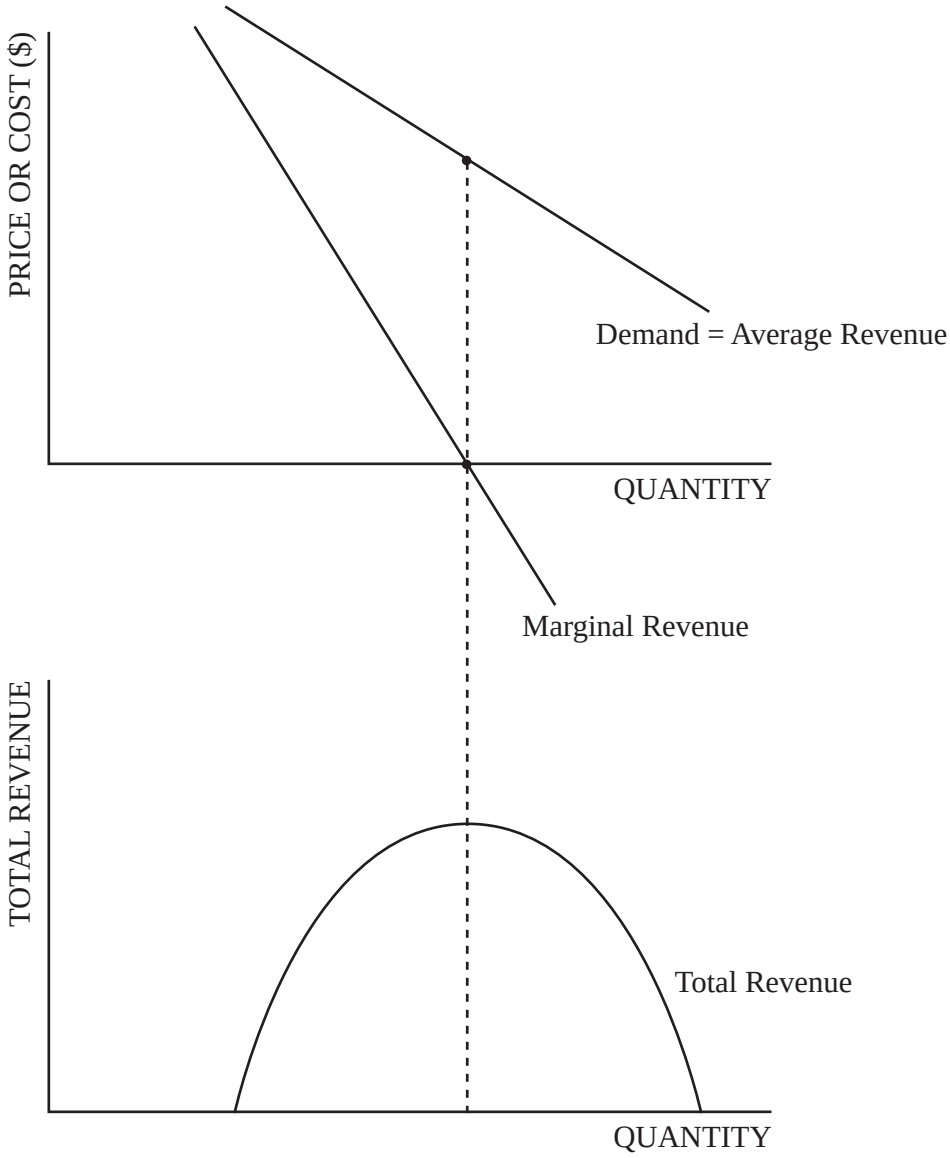
| Quantity | Price | Total Revenue | Average Revenue | Marginal Revenue |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 1 | 10 | 10 | 10 | 10 |
| 2 | 8 | 16 | 8 | 6 |
| 3 | 6 | 18 | 6 | 2 |
| 4 | 4 | 16 | 4 | -2 |

3) Marginal revenue can actually be negative, as shown by the marginal revenue curve falling below the X axis. Monopolists will not produce beyond this point voluntarily, as they will lose money on each unit produced.
4) There are occasions when monopolists will produce beyond where marginal revenue = 0. This is usually the result of government regulation – the government feels the monopolist's product is important enough that more consumers should benefit from increased output at a lower price. If this mandated level of output causes the monopolist to lose money, the government will often subsidize the production of the good.
5) Regulated monopolies face two possible price-and-output combinations, depending on the goal of the regulation. The first is called the "**socially optimal point**" and occurs where P = MC = D. This point is the closest a monopoly can get to operating like a perfectly competitive firm. A "**fair return**" or "break even" price occurs where P = ATC = D. Here, the firm is making zero economic profits.



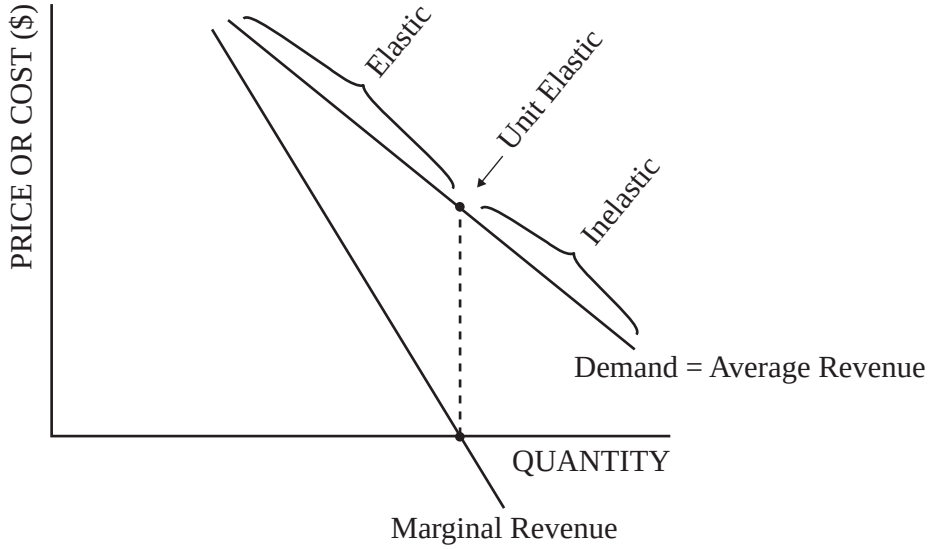

*Graph L: Monopoly*

6) At the point where MR = 0 (where marginal revenue crosses the X axis), total revenue is at its greatest level.




*Graph M: Marginal vs. Total Revenue*

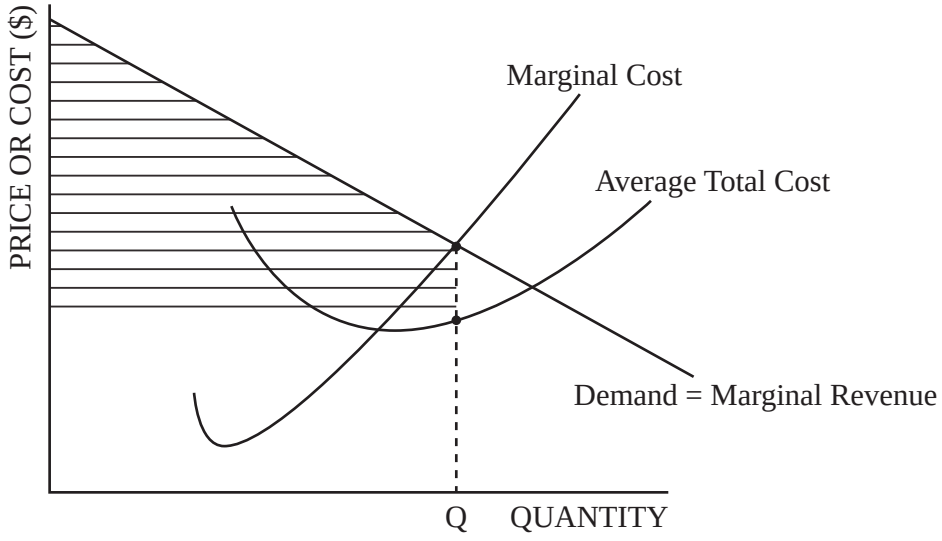
Also, MR = 0 is a significant point in that this is where the demand curve changes its elasticity. Above the point where MR = 0, that portion of the demand curve is elastic; below MR = 0, demand is inelastic. The exact point where MR = 0 is unit elastic. *Graph N* shows these concepts.




*Graph N: Monopoly and Elasticity*

Another type of monopoly is a price-discriminating monopoly. The main advantage a **price-discriminating monopolist** has over a **single-priced, non-regulated monopolist** is the opportunity to earn greater profits. Price-discriminating monopolists are called such because they are able to discriminate between prices that different customers are willing to pay and charge them accordingly. Consumers who are willing to pay more, do; those who want to pay less, do so as well. This is possible for three reasons:

1) The firm has monopoly power: it can determine the price it charges.
2) Elasticity of demand: the firm can identify its customers' elasticity of demand and is able to segment the market accordingly.
3) In order to ensure its market power, resale of its good or service is difficult.

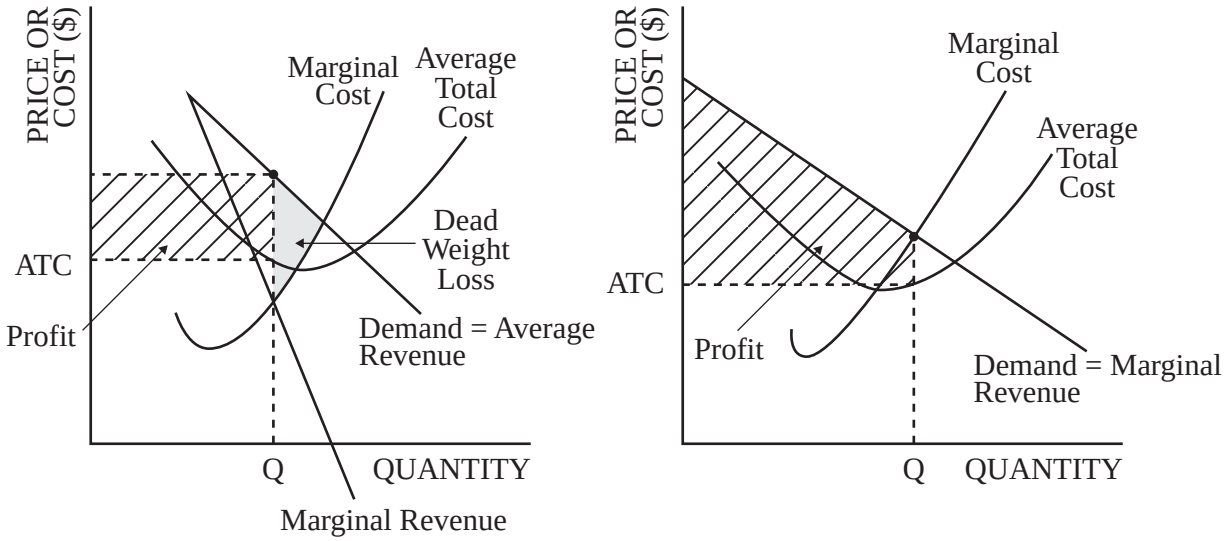



*Graph O: Price-Discriminary Monopoly*

Notice that in *Graph O*, the demand and marginal revenue curves are the same. For a price-discriminating monopoly, D = MR = P but not AR because:

| Quantity | Price | Total Revenue | Average Revenue | Marginal Revenue |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 1 | 10 | 10 | 10 | 10 |
| 2 | 10 + 8 | 18 | 6 | 18 |
| 3 | 10 + 8 + 6 | 24 | 8 | 24 |
| 4 | 10 + 8 + 6 + 4 | 28 | 7 | 28 |

Total revenue reflects the fact that each consumer pays his own price (thus, P still equals demand). Thus, as in the table on page 77, in order to sell an additional unit, the monopolist must lower his price. However, he does not have to lower his price for all buyers; because he is able to segment his market, each consumer pays according to his own assessment of what the good or service is worth.

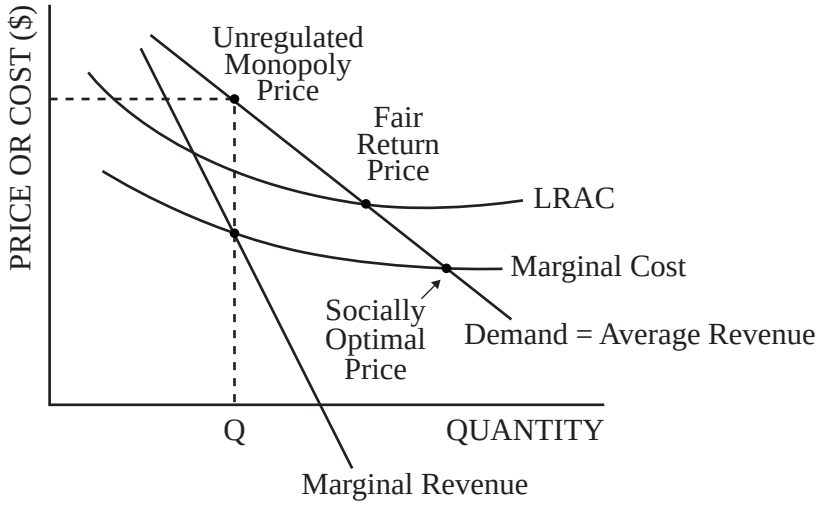



*Single-priced Non-regulated Monopoly* *Price Discriminating Monopoly*

*Graph P: Comparing Profit*

Also note the comparisons of profit earned by a single price, non-regulated monopolist and a price-discriminating monopolist. The areas shaded in *Graph P* show this difference.

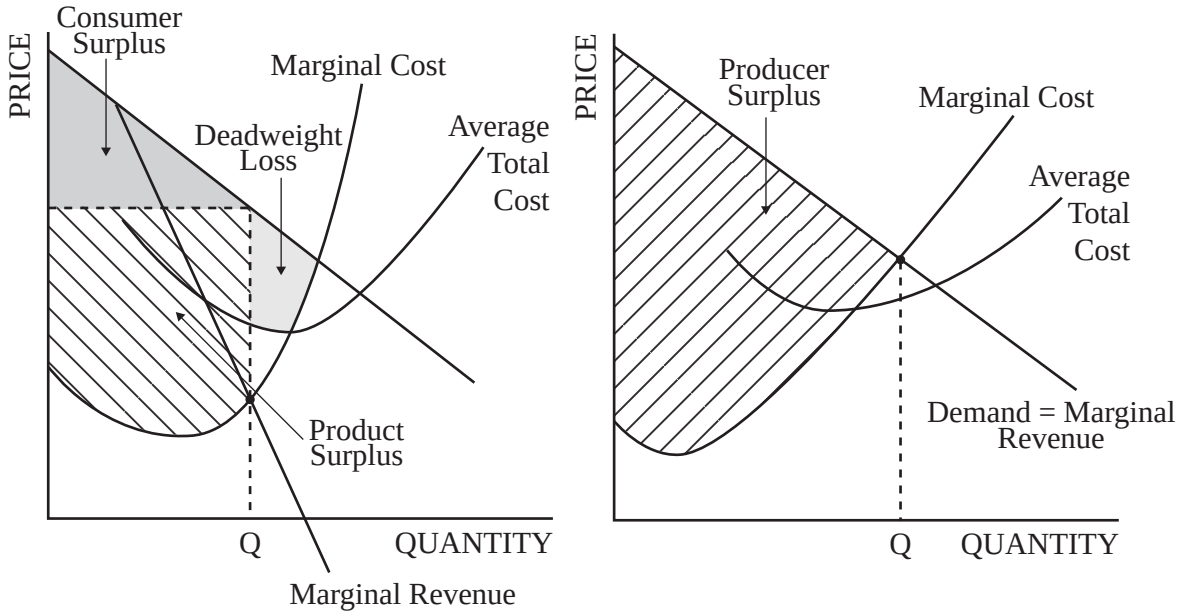
A **natural monopoly** is one that benefits from economies of scale, and its average total cost curve reflects that. Often, these are public utilities that benefit from economies of scale. For example, it makes little sense to have competing electric companies provide service to the same market area. This would result in each company's wires being strung all over town, which is cumbersome and aesthetically undesirable. The same used to be true for telephone companies; however, the proliferation of wireless phones has made the telephone industry more competitive. *Graph Q* shows a natural monopoly.




*Graph Q: Natural Monopoly*

The concepts of consumer surplus and deadweight loss affect the monopoly graph differently depending on whether it is a price-discriminating monopoly or a single price, non-regulated monopoly.

Because P > MC = MR in a single price, non-regulated monopoly, the consumer surplus that existed under perfect competition is mostly transferred to the producer, who benefits from the fact that he has price-setting power. This higher price and lower quantity sold means that there is deadweight loss, as the market is inefficient compared to a perfectly competitive one. In a price-discriminating monopoly, however, each consumer is paying his preferred price, which means that there is no consumer surplus – it is all transferred to the producer – and there is no deadweight loss, as quantity sold is determined where P = MC. See *Graph R* for an illustration of this difference.




*Single Price Non-regulated Monopoly* *Price-discriminating Monopoly*

*Graph R: Comparing Surplus*

## Oligopoly

Oligopolies are similar to monopolies in terms of price-setting power and the ability to price-discriminate. However, because there is some degree of competition, an oligopoly's market behavior is interdependent – it must watch and react to its competitors in order to maintain (or, at least not lose) its market share. This, at times, leads to **collusion**, where oligopolistic firms agree to charge similar prices with the hope of gaining monopoly power. Such **cartels** are illegal since this behavior harms the consumer. Collusion is easiest when the product is homogeneous. Oligopolies, though, spend much time and effort attempting to differentiate their products from their competitors' through non-price competition.

There is no agreed-upon graph for an oligopoly. Unique to oligopoly, though, is the concept of **game theory**, which illustrates firms' interdependence and helps predict outcomes given another firm's pricing strategy. Game theory uses a matrix that shows two players' payoffs given certain behaviors.

Assume we have two airlines, Ski Airlines and Air Snowboard. Both airlines fly to the best alpine ski destinations, and both are interdependent because they must take into consideration their competitor's price when setting their own – since there are two airlines that provide similar service, consumers can chose their preferred airline based on price. The table below shows the resulting profits from each ticket price (profits are in thousands).

| | | Ski Airlines | |
|---|---|---|---|
| | | \$140 per ticket | \$135 per ticket |
| Air Snowboard | \$140 per ticket | \$65/\$62 | \$64/\$64 |
| | \$135 per ticket | \$74/\$55 | \$63/\$60 |

Notice that a **dominant strategy** exists – that place where the payoff is largest, regardless of what the other competitor does. If Air Snowboard charges $140 per ticket, Ski Airlines should charge $135 because it will earn $64,000 in profits rather than $62,000. If Air Snowboard charges $135 a ticket, Ski Airlines will make the most profit by charging $135 a ticket ($60,000 vs. $55,000). Thus, Ski Airlines' dominant strategy is $135.

Air Snowboard does not have a dominant strategy, however. If Ski Airlines charges $140, Air Snowboard should charge $135 ($74,000 vs. $65,000); however, if Ski Airlines charges $135, then Air Snowboard should charge $140 ($64,000 vs. $60,000). This means Air Snowboard's pricing strategy is always dependent on that of Ski Airlines.

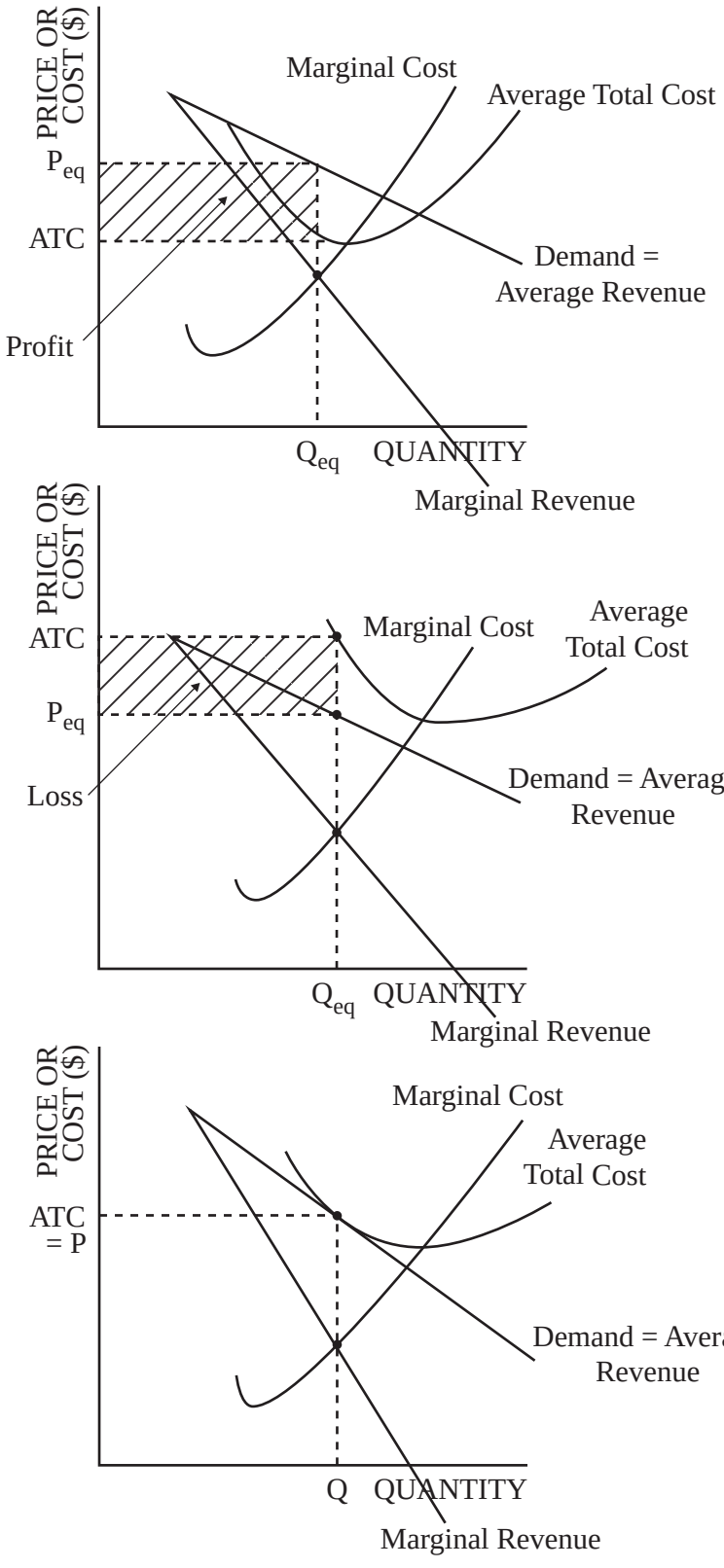
Both firms might be tempted to collude by charging $140 a ticket. This would guarantee both airlines a higher profit ($65,000 rather than $64,000 for Air Snowboard, and $62,000 rather than $60,000 for Ski Airlines). However, the temptation to cheat and secretly charge $135 – and thus steal customers – while the other is honoring the $140 price is too great. This is why cartels usually fail.

**Pareto Efficiency** occurs when resources are allocated efficiently, and changing the allocation of resources would cause harm to one or more participants. A **Nash Equilibrium** exists when no participant has an incentive to change his behavior after considering his opponent's strategy – he would be no better off than he is currently and thus a dominant strategy does not exist.

## Monopolistic competition

Monopolistic competition is the most common market structure, as most retail businesses fall into this category. Due to the large number of competitors, monopolistically competitive firms, like oligopolies, are focused on product differentiation via non-price competition. One of the preferred types of non-price competition is advertising, where the goal is to develop brand loyalty and gain a market niche.

In the short-run, this non-price competition allows for economic profit. In the long-run, though, due to competition and the fact that each firm's products are almost homogeneous, economic profits equal zero. An example would be a clothing store – it might sell trendy clothing, but in the long-run it is really only selling jeans, which can be bought elsewhere are various prices. *Graph S* on page 84 shows the profit, loss, and long-run situations of monopolistic competition.




*Monopolistic Competition Gaining a Profit*

*Monopolistic Competition Earning a Loss*

*Monopolistic Competition Long-run Equlibrium*

*Graph S: Monopolistic Competition*

Notice that monopolistic competition and single-price monopoly graphs look very similar. However, unlike a monopoly, because there are few barriers to entry, the result is a long-run graph that shows no economic profit as firms enter and leave the market.

## Types of Business Ownership

These market structures can exist as one of three types of entities; a **sole proprietorship**, where the owner receives all the profits but also is responsible for all risks and liabilities; a **partnership**, where one or more individuals work together and share both profits and losses; or a third, a **corporation**, where a state-registered charter creates a legal entity that has limited liability – individuals work for the corporation, but the individuals are not held liable for any losses if the corporation is sued.

In the next unit, we'll graph the factors of production that make it possible for these market structures to exist.

## New Terms

- Profit
- Total revenue
- Total cost
- Fixed cost
- Variable cost
- Total cost
- Average fixed cost
- Average variable cost
- Average total cost
- Marginal cost
- Profit-maximizing output
- Economies of scale
- Constant returns to scale
- Diseconomies of scale
- Long-run average cost
- Perfect competition
- Monopoly
- Monopolistic competition
- Oligopoly
- Barriers to entry
- Non-price competition
- Natural monopoly
- Price-discriminating monopoly
- Fair return price
- Socially optimal price
- Game theory
- Dominant strategy
- Pareto Efficiency
- Nash Equilibrium
- Sole proprietorship
- Partnership
- Corporation

# MULTIPLE-CHOICE QUESTIONS

1. A firm that decides to shut-down but is still in business would find which of the following to be true of its fixed and variable cost?

| | Fixed Cost | Variable Cost |
|---|---|---|
| (A) | $0 | $0 |
| (B) | $0 | positive |
| (C) | positive | $0 |
| (D) | positive | positive |
| (E) | positive | negative |

Questions 2-6 refer to the table below:

| Output | Total Revenue | Variable Cost | Fixed Cost | Total Cost |
|---|---|---|---|---|
| 0 | _____ | _____ | _____ | 200 |
| 1 | _____ | 50 | _____ | _____ |
| 2 | _____ | 70 | _____ | _____ |
| 3 | $300 | 85 | _____ | _____ |
| 4 | _____ | 95 | _____ | _____ |
| 5 | _____ | 105 | _____ | _____ |
| 6 | _____ | 130 | _____ | _____ |
| 7 | _____ | 210 | _____ | _____ |
| 8 | _____ | 410 | _____ | _____ |

2. Based on the information in the table above, the total cost of producing 5 units of output is:

(A) 105
(B) 200
(C) 305
(D) 330
(E) 410

3. Based on the information in the table, the marginal cost of producing the 4th unit of output is:

(A) 10
(B) 15
(C) 20
(D) 75
(E) 175

4. Based on the information in the table, the price of the product this firm is selling is:

(A) $20
(B) $40
(C) $100
(D) $120
(E) Not able to be determined from the information given.

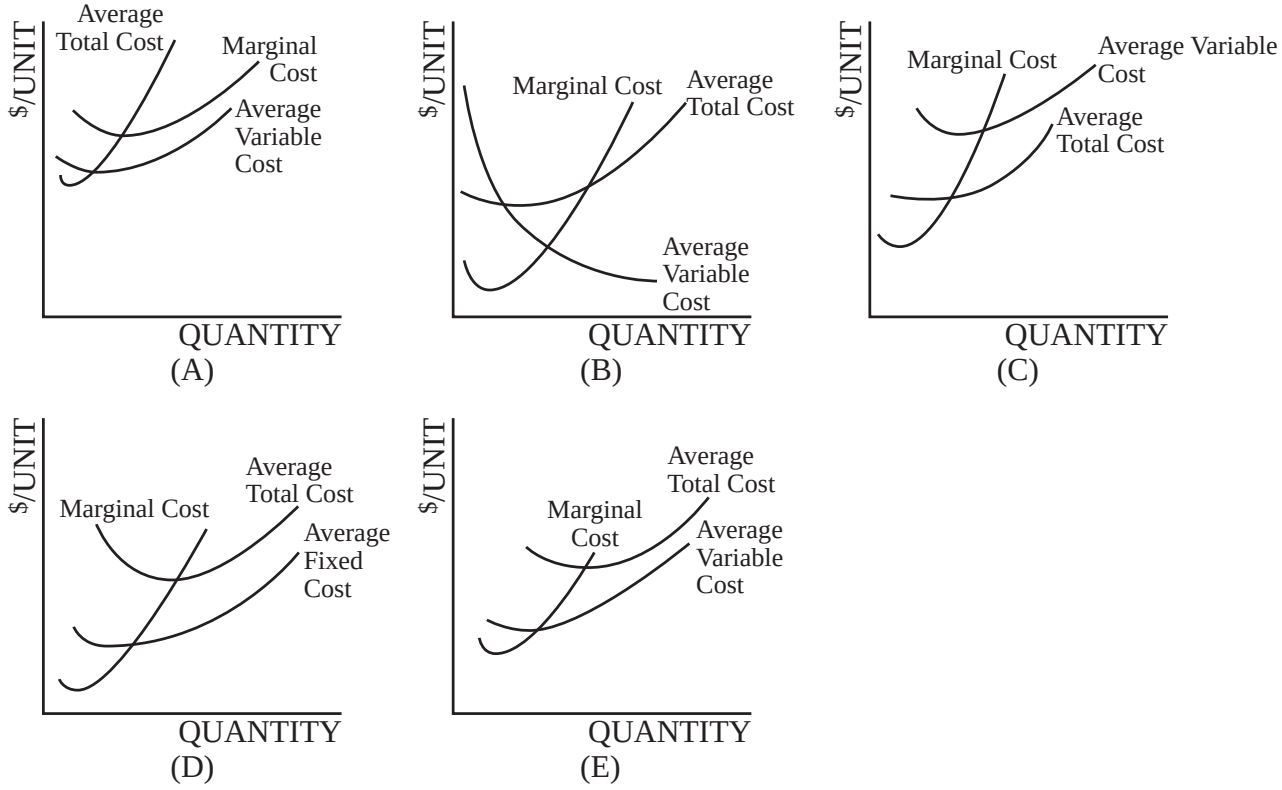
5. Based on the information in the table, the average fixed cost of producing 5 units of output is:

(A) 200
(B) 100
(C) 95
(D) 40
(E) 20

6. Based on the information in the table, the profit-maximizing level of output for this firm is:

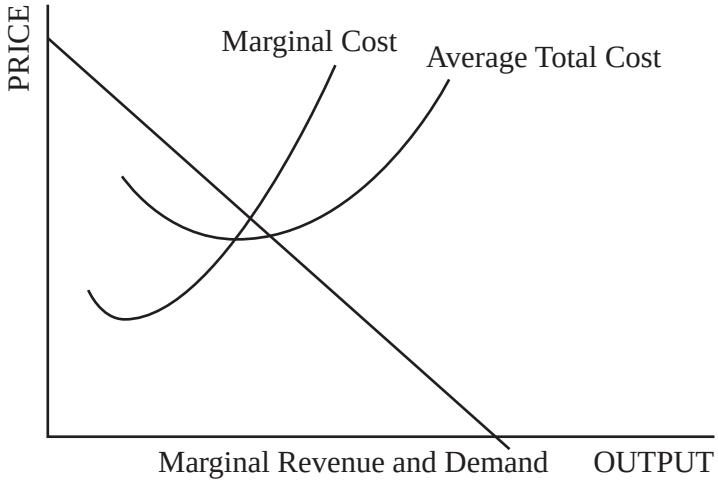
(A) 8
(B) 7
(C) 6
(D) 5
(E) 0

7. Which set of cost curves in the figures below is correctly drawn?



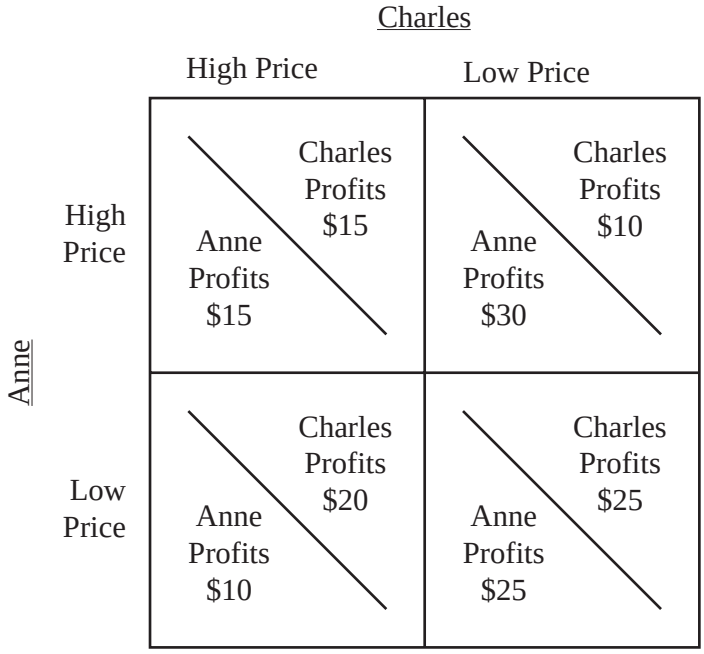

(A) A
(B) B
(C) C
(D) D
(E) E

8. The firm depicted in the graph below is




(A) a perfectly competitive firm.
(B) a perfectly price discriminating monopoly.
(C) a single price monopoly.
(D) an oligopoly in the long-run.
(E) a monopolistically competitive firm in the long-run.

Questions 9-11 refer to the table below:




9. Based on the information in the payoff matrix box depicted above, we can conclude that in the absence of collusion

   (A) Charles and Anne will each charge a low price.
   (B) Charles and Anne will each charge a high price.
   (C) Charles will charge a high price and Anne will charge a low price.
   (D) Charles will charge a low price and Anne will charge a high price.
   (E) no conclusion can be accurately drawn from the information given.

10. Based on the information in the payoff matrix box depicted above, we can conclude that

   (A) Charles has a dominant strategy and Anne does not.
   (B) Charles and Anne both have a dominant strategy.
   (C) Charles and Anne do not have a dominant strategy.
   (D) Charles does not have a dominant strategy but Anne does.
   (E) no conclusion can be accurately made from the information given in regards to dominant and non-dominant strategy.

11. If Charles and Anne can successfully collude and agree to a binding enforceable agreement, what would be Anne's profit?

(A) 10
(B) 15
(C) 20
(D) 25
(E) 30

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12. The three basic forms of business organization are

(A) proprietorship, partnership, monopoly.
(B) proprietorship, partnership, competition.
(C) proprietorship, partnership, corporation.
(D) proprietorship, monopoly, competition.
(E) monopoly, competition, oligopoly.

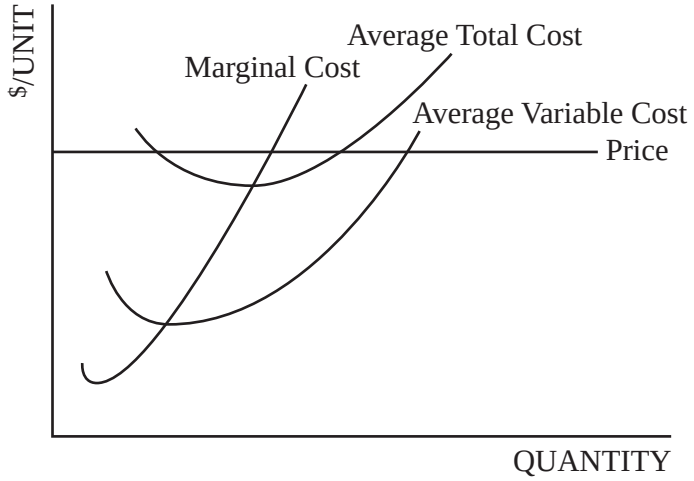
13. Firms in all market structures seek to

(A) maximize price and therefore maximize profit.
(B) minimize cost and therefore maximize profit.
(C) operate where MC = MR and are therefore guaranteed a profit.
(D) maximize profit.
(E) no conclusion can be accurately drawn for firms in all market structures in regard to profit maximizing behavior.

14. If fixed costs for a firm operating under conditions of perfect competition increased, but not enough to lead the firm to shut down, how would that change in fixed cost affect output, profit, and price of the firm?

| | Output | Profit | Price |
|---|---|---|---|
| (A) | no change | no change | no change |
| (B) | no change | decrease | no change |
| (C) | no change | decrease | increase |
| (D) | decrease | decrease | increase |
| (E) | decrease | decrease | no change |

15. Based on the graph below, this is a firm facing which combination of events?




| | Profits | Entry or exit of firms to this market |
|---|---|---|
| (A) | Positive | Firms entering the market in the long-run |
| (B) | Positive | Firms exiting the market in the long-run |
| (C) | Normal | Firms stable in the market in the long-run |
| (D) | Negative | Firms entering the market in the long-run |
| (E) | Negative | Firms exiting the market in the long-run |

16. Marginal cost is calculated by

(A) adding total cost at two consecutive units of output.
(B) subtracting total cost at two consecutive units of output.
(C) adding fixed and variable cost.
(D) subtracting fixed cost from total cost.
(E) subtracting variable cost from total cost.

17. Which of the following correctly ranks market structures from least to most competitive?

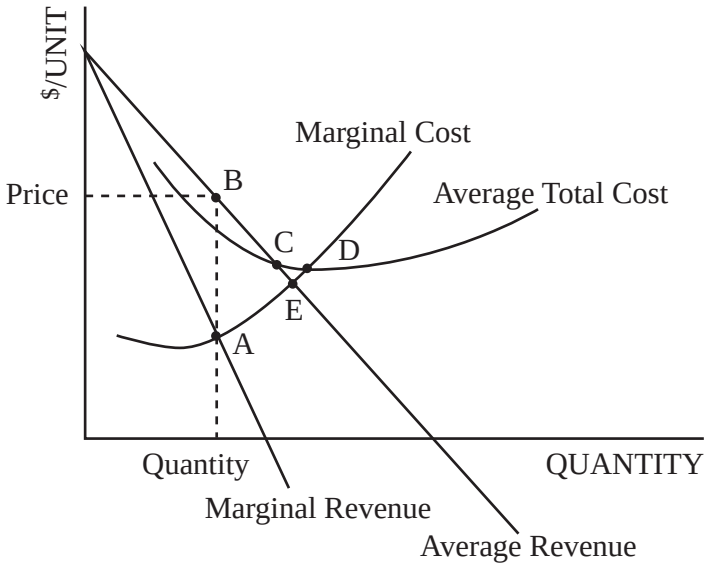
(A) monopoly, oligopoly, monopolistic competition, perfect competition
(B) monopoly, monopolistic competition, oligopoly, perfect competition
(C) perfect competition, oligopoly, monopolistic competition, monopoly
(D) perfect competition, monopoly, oligopoly, monopolistic competition
(E) perfect competition, monopolistic competition, oligopoly, monopoly

18. Which of the following is/are necessary for a firm to be able to engage in price discrimination?

I. Subdivide the market
II. Prevent resale
III. Monopoly power

(A) III only
(B) I and II only
(C) I and III only
(D) II and III only
(E) I, II, and III

19. Based on the graph in the figure below, the monopoly price, break-even price, and socially optimum price are (respectively):

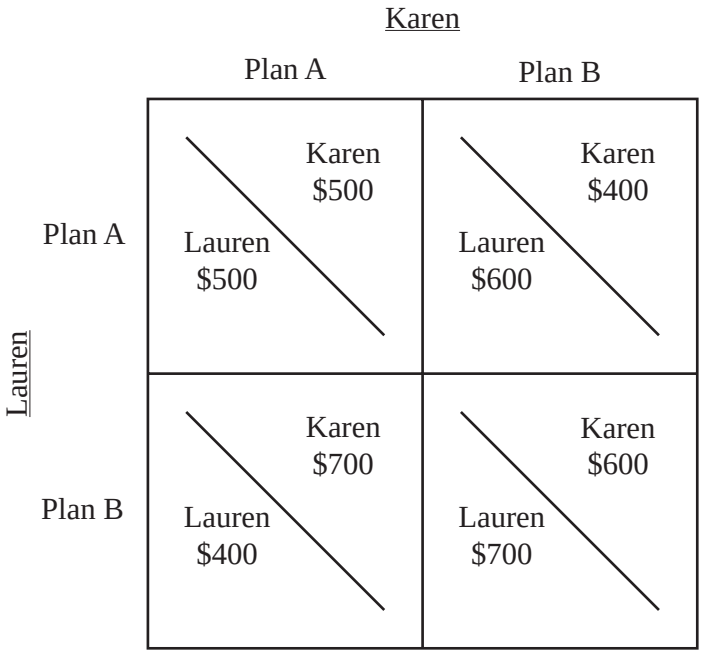



| | Profit Maximizing Point | Fair Return, or Break-Even Point | Socially Optimum Point |
|---|---|---|---|
| (A) | A | B | C |
| (B) | E | C | B |
| (C) | C | D | E |
| (D) | B | C | D |
| (E) | B | C | E |

20. Which of the following is true for both a perfect competitor and a monopolistic competitor in long-run equilibrium?

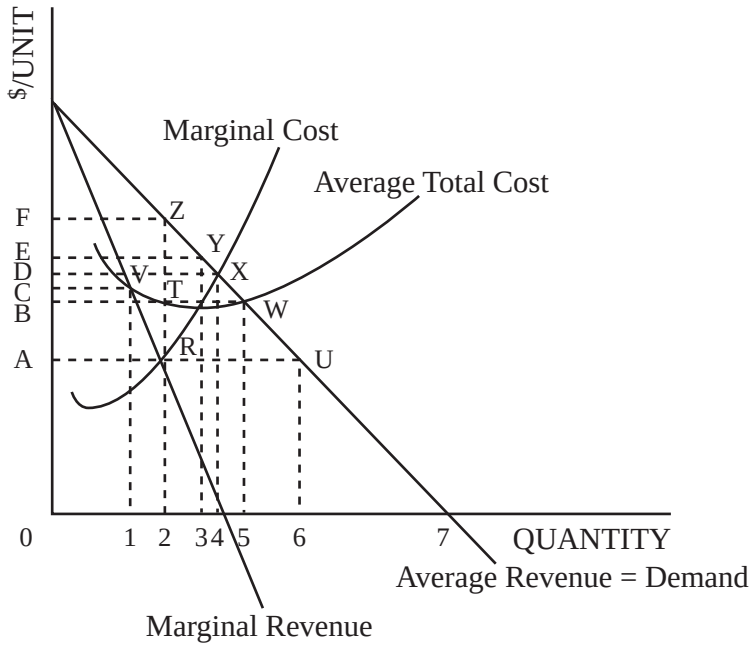
| | Perfect Competitor | Monopolistic Competitor |
|---|---|---|
| (A) | Earns normal profits | Earns normal profits |
| (B) | Is allocatively efficient | Is allocatively efficient |
| (C) | Is productively efficient | Is productively efficient |
| (D) | Produces at P = MC | Produces at P = MC |
| (E) | Produces at min. ATC | Produces at min. ATC |

21. Based on the table below, which of the following is true?




(A) Karen has a dominant strategy but Lauren does not.
(B) Lauren has a dominant strategy but Karen does not.
(C) Karen and Lauren both have a dominant strategy.
(D) Neither Karen nor Lauren has a dominant strategy.
(E) No conclusion can be made in regard to dominant strategy from the information given.

Questions 22-25 refer to the figure below:




22. What area in the figure above describes total revenue at the profit maximizing level of output?

(A) A, R, 2, 0
(B) F, Z, 2, 0
(C) B, W, 5 0
(D) C, X, 4, 0
(E) A, U, 6, 0

23. What area in the figure above describes total cost at the profit maximizing level of output?

(A) A, R, 2, 0
(B) F, Z, 2, 0
(C) C, X, 4, 0
(D) B, T, 2, 0
(E) B, W, 5, 0

24. What area in the figure above represents profit or loss at the profit maximizing level of output?

(A) A loss of A, R, 2, 0
(B) A profit of F, Z, 2, 0
(C) A profit of F, Z, R, A
(D) A loss of F, Z, T, B
(E) A profit of F, Z, T, B

25. If the government imposes a lump-sum tax on the monopolist in the figure, what will be the effect on the profit maximizing level of output?

(A) It will decrease to 0.
(B) It will decrease to 1.
(C) It will remain at 2.
(D) It will increase to 3.
(E) It will increase to 5.

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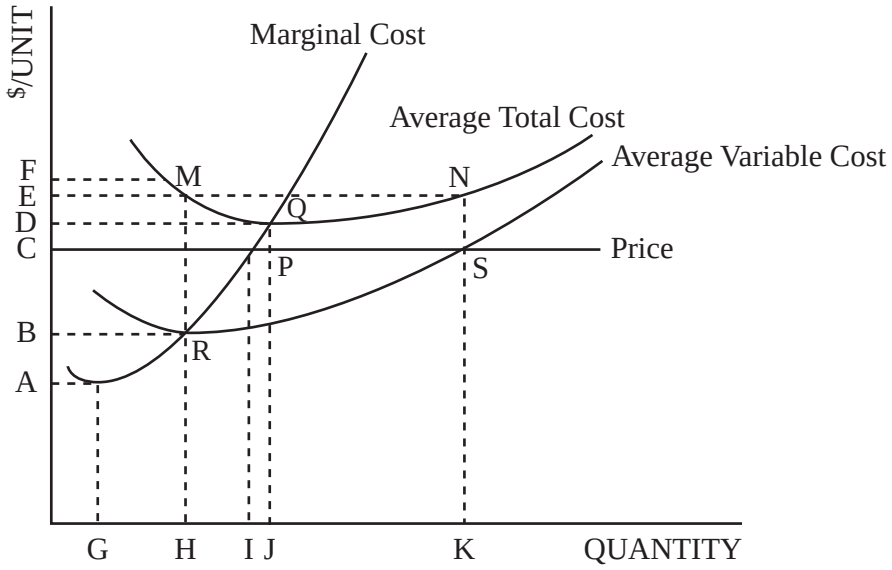
Questions 26-27 refer to the figure below:




26. In the figure above, at what level of output are average costs minimized?

(A) G
(B) H
(C) I
(D) J
(E) K

27. Based on the information in the figure above, total fixed cost is equal to

(A) F, M, H, 0
(B) B, R, H, 0
(C) C, S, K, 0
(D) D, Q, J, 0
(E) E, N, S, C

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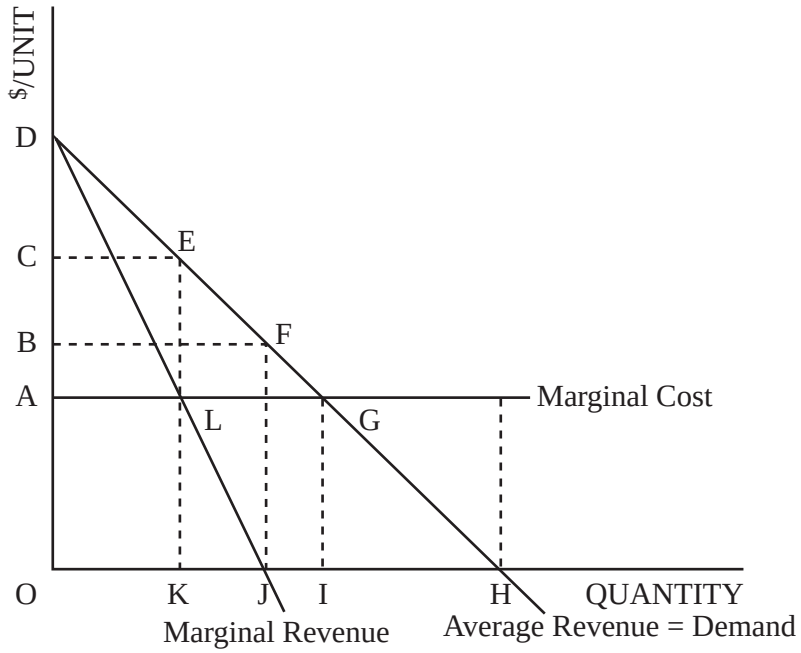
Questions 28-32 refer to the figure below:




28. Based on the information in the figure above, consumer surplus is represented by the area:

(A) D, H, 0
(B) D, E, C
(C) D, J, 0
(D) C, E, L, A
(E) A, L, K, 0

29. Based on the information in the figure above, the amount of profit is represented by the area:

(A) D, H, 0
(B) D, E, C
(C) D, J, 0
(D) C, E, L, A
(E) A, L, K, 0

30. Based on the information in the figure above, the amount of deadweight loss due to monopoly is represented by the area:

(A) D, H, 0
(B) D, E, C
(C) D, J, 0
(D) E, G, L
(E) C, E, L, A

31. If the monopolist shown in the figure is able to perfectly price discriminate, the maximum profit output is:

(A) O
(B) K
(C) J
(D) I
(E) H

32. If the monopolist shown in the figure is able to perfectly price discriminate, consumer surplus is:

(A) DHO
(B) DEC
(C) DJO
(D) CELA
(E) Zero

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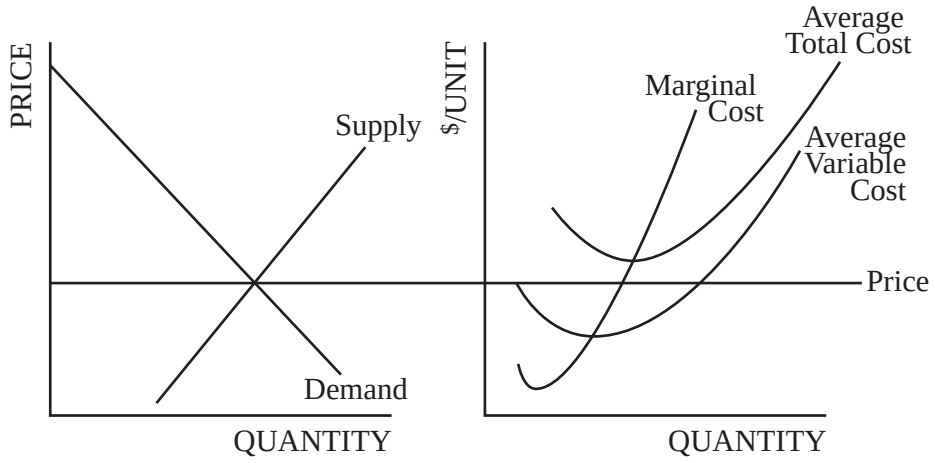
Questions 33-34 refer to the figure below:




33. Based on the information in the figure above, which of the following is correct?

(A) Graph A is for the market and graph B is for the firm.
(B) Graph A is the short-run market and graph B is the long-run market.
(C) Graph A is the long-run market and graph B is the short-run market.
(D) Graph A is for the firm and graph B is for the market.
(E) Graph A is for a perfectly competitive firm and graph B is for a monopoly.

34. Based on the information in the figure, which of the following is correct?

(A) Firms will enter the market and drive the price down.
(B) Firms will enter the market and drive the price up.
(C) Firms will exit the market and drive the price up.
(D) Firms will exit the market and drive the price down.
(E) Firms will neither enter nor exit the market and the price will remain stable.

---

35. Which of the following is true if a monopolist is operating in the elastic portion of the demand curve?

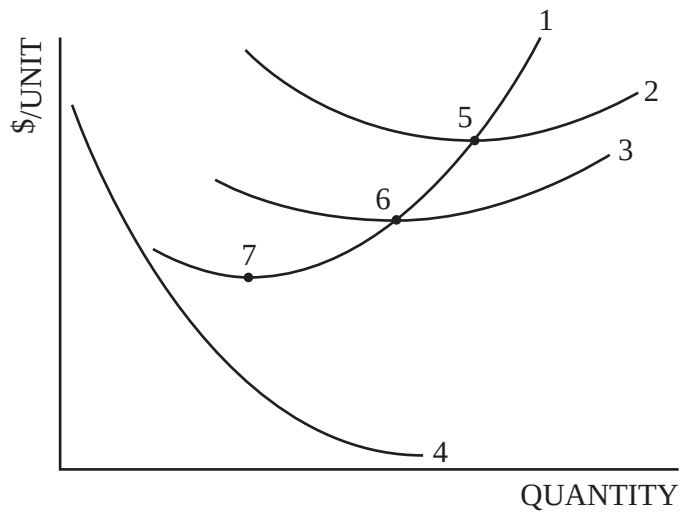
(A) Marginal revenue is positive.
(B) Marginal revenue is negative.
(C) Marginal revenue is zero.
(D) Marginal cost is negative.
(E) Marginal cost is zero.

# FREE-RESPONSE QUESTIONS

1. Create side-by-side graphs for a perfectly competitive firm earning short-run economic profits.

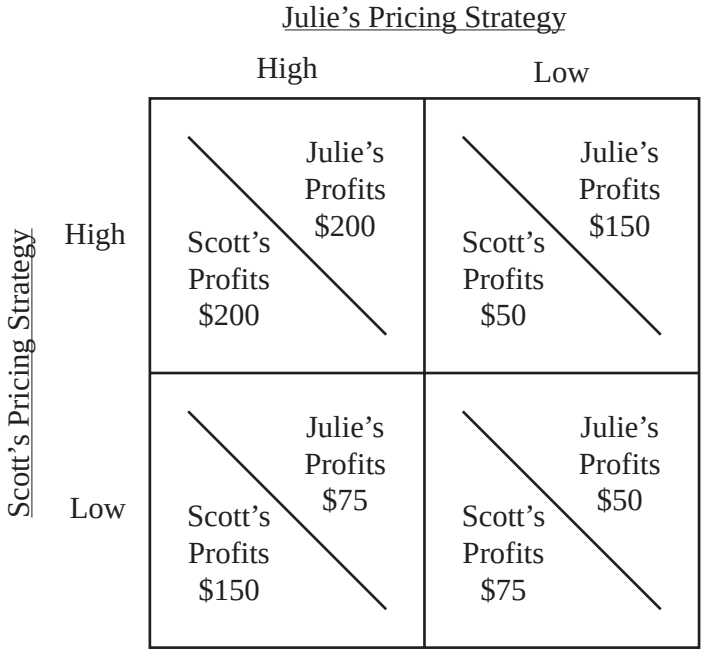
   (a) Is the short-run economic profit sustainable in the long-run? Explain.
   (b) Redraw the graph you drew to demonstrate the long-run equilibrium position for the firm and the market.
   (c) Identify the allocatively efficient level of output on the graph you drew for part (b).

2.




(a) On the graph above, correctly identify curves 1, 2, 3, and 4.
(b) Identify the market structure in which this firm is operating.
(c) If this firm is operating in a perfectly competitive market, identify a price that could exist only in short-run equilibrium.
(d) If this firm is operating in a perfectly competitive market, identify a price that could exist only in long-run equilibrium.

3.




Julie and Scott each own a firm operating in a local market. They face no other competition, they sell a slightly differentiated product, and they face significant barriers to entry. Based on this information, and the information in the figure above, answer each of the following:

(a) In what market structure do Julie and Scott operate? Explain.
(b) Does Julie have a dominant strategy? Explain.
(c) Does Scott have a dominant strategy? Explain.
(d) In the absence of collusion, what pricing strategy will prevail in this market?