

1. The following data shows the relationship between price and quantity demanded at four different prices for a product:

$P = \$11, Q_d = 16$

$P = \$9, Q_d = 24$

$P = \$7, Q_d = 32$

$P = \$5, Q_d = 40$

Using the midpoints formula, what is the price elasticity of demand between: (a) \$11 and \$9; (b) \$9 and \$7; (c) \$7 and \$5?

Ans: (a) 2.0; (b) 1.14; (c) 0.67

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Learning Objective: 4.1

2. What is the significance of a price elasticity of demand that is equal to 2?

Ans: A price elasticity of demand equal to 2 indicates that demand is elastic. More precisely, the value indicates that a 1% change in the price of a product will cause a 2% change in the quantity demanded of that product. An increase in the price of the product will lead to lower total revenues and a decrease in price will lead to higher total revenues.

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Learning Objective: 4.1

3. What is the significance of a price elasticity of demand that is equal to 0.4?

Ans: A price elasticity of demand equal to 0.4 indicates that demand is inelastic. More precisely, the value indicates that a 1% change in the price of a product will cause a 0.4% change in the quantity demanded of that product. An increase in the price of the product will lead to higher total revenues and a decrease in price will lead to lower total revenues.

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Learning Objective: 4.1

4. What is the significance of a price elasticity of demand that is equal to 1?

Ans: A price elasticity of demand equal to 1 indicates that demand is unit elastic. More precisely, the value indicates that a 1% change in the price of a product will cause a 1% change in the quantity demanded of that product. A change in the price of the product will not affect total revenues.

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Learning Objective: 4.1

5. What is the significance of a price elasticity of demand that is infinite?

Ans: A price elasticity of demand that is infinite indicates that demand is perfectly elastic. Consumers are completely sensitive to changes in price. A very small decrease in the price of the product will cause consumers to increase their quantity demanded from zero to as much as they could obtain. If consumers are already purchasing the product, any increase in its price will cause consumers to purchase zero.

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Learning Objective: 4.1

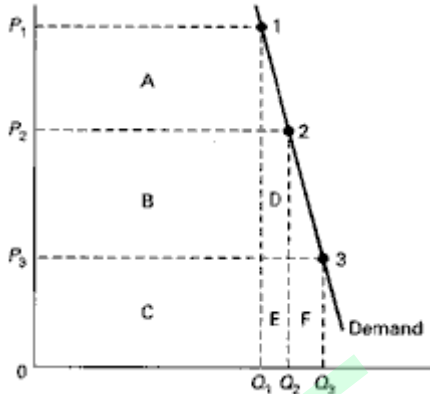
6. What is the significance of a price elasticity of demand that is equal to 0?

Ans: A price elasticity of demand equal to 0 indicates that demand is perfectly inelastic. The quantity demanded by consumers is completely unresponsive to changes in price. Any change in the price of the product will not affect the quantity demanded but will lead to an identical percentage change in total revenues.

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Learning Objective: 4.1

7. Use the below graph to show what happens to total revenue when: (a) price falls from P_1 to P_2 ; (b) price rises from P_3 to P_2 . Explain your answer in terms of areas of total revenue gained or lost using the alphabetical letters representing different areas on the graph. (c) Is demand elastic or inelastic? How do you know?



- Ans: (a) Total revenue when price is P_1 is areas $A + B + C$. When price falls to P_2 , total revenue is areas $B + C + D + E$. The size of lost area A is greater than gained areas $D + E$, so total revenue will fall.
- (b) Total revenue when price is P_3 is areas $C + E + F$. When price rises to P_2 , total revenue is areas $B + C + D + E$. The change in price resulted in a loss of area F , but a larger gain in areas $B + D$. Thus total revenue will rise.
- (c) Demand is inelastic based on the total revenue test. As price falls from P_1 to P_2 , total revenue falls or as price rises from P_3 to P_2 , total revenue increases.

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Learning Objective: 4.2

8. The demand for a product is unit elastic throughout. If consumers purchase 8,000 units when the price is \$5, how many units will they purchase if the price is \$4?

Ans: Since demand is unit elastic throughout, the total revenues generated when the price is \$5 must be the same as those when the price is \$4. At \$5, total revenues are \$40,000. Therefore, at \$4, consumers must purchase 10,000 units.

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Learning Objective: 4.2

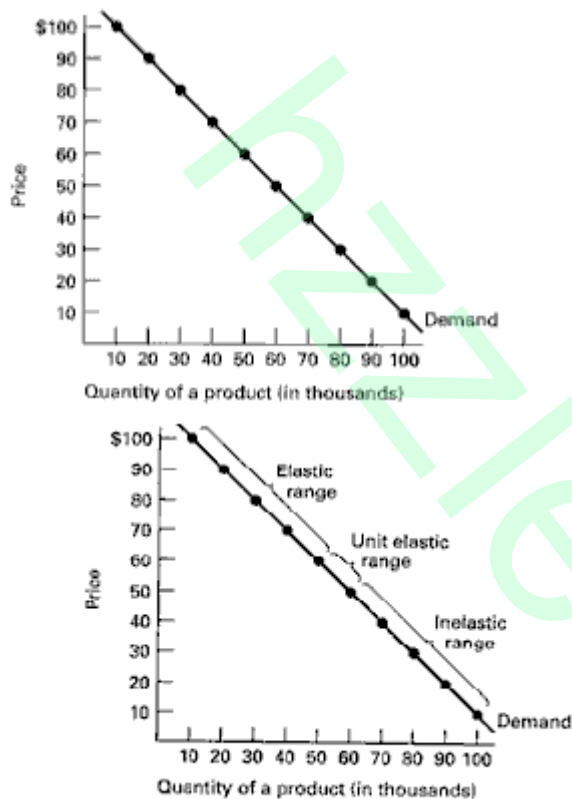
9. What is the price elasticity of demand if a 10% increase in price causes a 10% increase in total revenues?

Ans: According to the total revenue test, demand is inelastic. In fact, demand is perfectly inelastic. After the price increase, producers will sell the same quantity as before but will charge a 10% higher price. As a result, total revenues rise by an equal 10%.

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Learning Objective: 4.2, 4.1

10. On the demand curve below, indicate the character of the price elasticity of demand across all prices.



Ans:

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Learning Objective: 4.2

11. The following is a straight-line demand curve that confronts a single firm.

<u>Price</u>	<u>Quantity demanded</u>	<u>(3)</u>	<u>(4)</u>
\$6	1	_____	_____
5	2	_____	_____
4	3	_____	_____
3	4	_____	_____
2	5	_____	_____
1	6	_____	_____

(a) In column 3, compute total revenue. In column 4, compute the coefficient for the price elasticity of demand at each price using the midpoints formula.

(b) Describe the character of elasticity across the prices based on the total revenue test and the elasticity coefficient.

(c) Does a straight-line demand curve have constant elasticity?

(d) Of what practical significance is your answer to (c)?

Ans:

<u>Price</u>	<u>Quantity demanded</u>	<u>(3)</u>	<u>(4)</u>
\$6	1	\$6	3.7
5	2	10	1.8
4	3	12	1.0
3	4	12	0.6
2	5	10	0.3
1	6	6	

(a) See the above table for the answers.

(b) Total revenue declines when price drops from \$3 to \$2, and the elasticity coefficient also becomes less than 1 at that price change. Demand is elastic in the range of prices between \$6 and \$4, and inelastic below \$3. A drop in price from \$4 to \$3 illustrates unitary elasticity.

(c) The clear answer is “no” based on the answers in the table. Although the slope of a linear demand curve is, by definition, constant, elasticity varies because it measures percentage changes.

(d) The significance is twofold. (1) One cannot tell elasticity by looking at a demand curve because the elasticity changes over the range of the curve. (2) The elasticity of demand for any product will depend on the level of its initial price and quantity, not just on the change in price. Therefore, the demand for a product may be very elastic in one price range (generally the higher price ranges) and very inelastic in another (lower) price range.

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Learning Objective: 4.2

12. Using the demand data given, complete the following table by computing total revenue at each of the prices. Indicate whether demand is elastic, inelastic, or unitary between each set of prices.

<u>Price</u>	<u>Quantity demanded</u>	<u>Total revenue</u>	<u>Character of demand</u>
\$1,000	300	\$ _____	_____
900	400	_____	_____
800	500	_____	_____
700	600	_____	_____
600	700	_____	_____
500	800	_____	_____
400	900	_____	_____
300	1,000	_____	_____
200	1,100	_____	_____
100	1,200	_____	_____

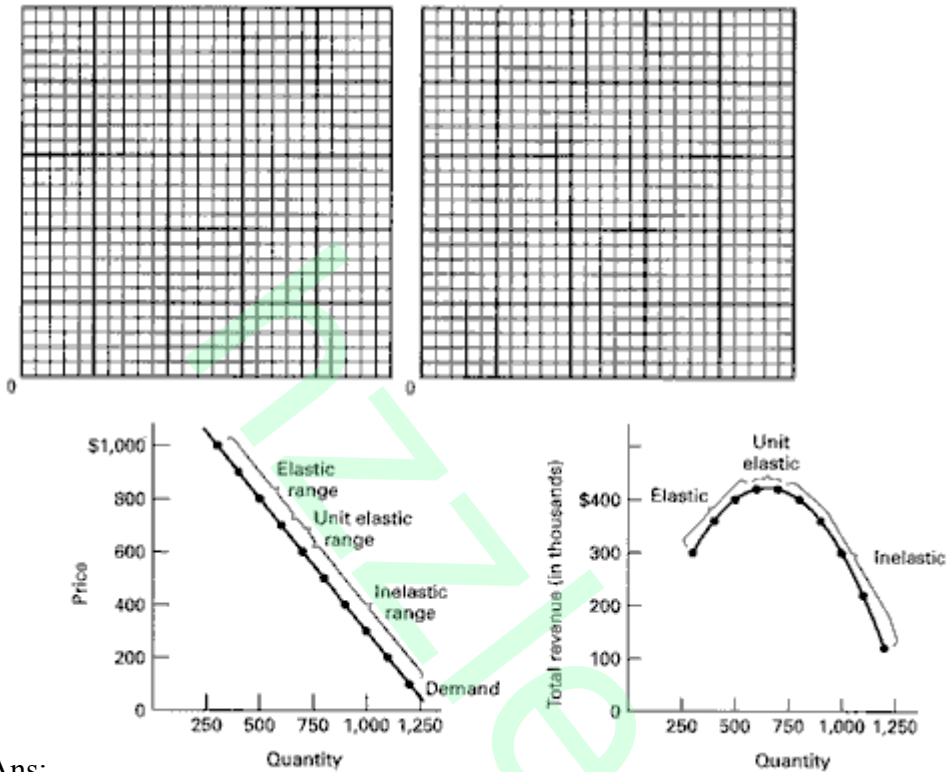
Ans:

<u>Price</u>	<u>Quantity demanded</u>	<u>Total Revenue</u>	<u>Character of demand</u>
\$1,000	300	\$300,000	elastic
900	400	360,000	elastic
800	500	400,000	elastic
700	600	420,000	unitary
600	700	420,000	inelastic
500	800	400,000	inelastic
400	900	360,000	inelastic
300	1,000	300,000	inelastic
200	1,100	220,000	inelastic
100	1,200	120,000	

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Learning Objective: 4.2

13. Use the data from the table in the previous question and the two graphs below for this problem. On the first graph: (a) plot the demand curve; and (b) indicate the elastic, unitary, and inelastic portions of the demand curve. On the second graph: (a) plot the total revenue on the vertical axis and the quantity demanded on the horizontal axis; (b) indicate the elastic, unitary, and inelastic portions of the demand and total revenue curves. (Note: The scale for quantity demanded that you plot on horizontal axis of each graph should be the same on both graphs.)



Ans:

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Learning Objective: 4.2

14. Evaluate. If the demand curve is linear, then the price elasticity of demand must be constant because the slope of the demand curve is constant.

Ans: This statement is false. Although the slope is constant, the price and quantity demanded combinations change. Therefore, the price elasticity of demand is not constant. Indeed, demand becomes less elastic as price falls along a linear demand curve.

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Learning Objective: 4.2

15. The president of a toy company asks you for advice about whether the company should cut the price of its best-selling doll this year based on the following information: last year the company cut the price of its best-selling doll by 10% and the quantity of dolls demanded increased by 10%.

Ans: The total revenue test indicates that the price elasticity of demand for the doll in last year's price range was unit elastic, or 1. If the firm cuts the doll's price this year, then it will most likely put the price of the doll in the inelastic range of demand, and thus a percentage change in price will lead to a greater percentage change in quantity in this range, causing total revenues to fall. You should advise the president not to cut the price because the firm is maximizing its total revenue.

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Learning Objective: 4.2

16. The owner of a health club asks you for advice about whether the company should raise or lower the price of its membership this year based on the following information: last year the club raised the price of its membership by 5% and the number of members paying the same fee fell by 7%.

Ans: The formula for the price elasticity of demand indicates the demand for memberships is price elastic or 1.4 in this case (7 divided by 5). This result suggests that total revenues for the club should have decreased last year. Another increase in price this year would only decrease total revenues. You should advise the owner to lower membership prices because it should increase total revenue given that the membership price is in the elastic range.

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Learning Objective: 4.2

17. The Metropolitan Transit System recently announced a 50% increase in the price of a transit ticket. The administrators said that they needed an increase in revenue to cover their rising costs. Explain the economic rationale for this decision.

Ans: The objective of the administrators is to increase revenue to cover rising costs. If they increase the price of a transit ticket to increase revenue, then the administrators must believe that the demand for transit services is inelastic in this price range.

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Learning Objective: 4.2

18. Ford Motor Company announced a major rebate program for its cars and trucks. The rebate program amounts to a simple reduction in price. The company executives hope to increase revenue as a result of this rebate program. What economic explanation would justify this decision?

Ans: The company executives believe that the price decrease will increase total revenue. In this case, the executives must think that demand is elastic in this price range. When demand is elastic, a cut in price will increase total revenue.

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Learning Objective: 4.2

19. A gasoline station very near a professional football stadium parks cars on its lot to make money on game days. Last year it charged \$4.00 per car and parked 1,000 cars. This year it raised the parking price to \$5.00 and parked 850 cars. Did the station owner make a good economic decision in raising the parking prices from one year to the next? Explain.

Ans: The owner made a good decision in raising price. The total revenue test indicates that total revenue increased with the increase in price. The \$4.00 price times 1,000 cars produced \$4,000 in revenue, but the \$5.00 price times the 850 cars produced \$4,250 in revenue, for a gain of \$250. These results indicate that demand for parking is inelastic in this price range. The midpoints formula also shows that demand is inelastic in the price range because the coefficient is 0.73.

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Learning Objective: 4.2

20. The president of the Micro Brewing Corporation asks you, as the company economist, to forecast changes in consumer beer purchases associated with a proposed price change. You conduct a survey and find that if the price of a six-pack increases from \$5.50 to \$7.50, the quantity demanded will decrease from 2,200 units to 1,800 units a month. Should the Micro Brewing Corporation raise its price? Explain the economic basis for this recommendation to the president.

Ans: Yes, the corporation should increase the price of a six-pack. Over the price range considered, the price elasticity of demand coefficient is 0.65, or inelastic, using the midpoints formula. An increase in price when demand is inelastic will increase total revenue. This increase in total revenue also can be shown by multiplication. With a price of \$5.50 times a quantity of 2,200 per month, the total revenue was \$12,100. With the higher price of \$7.50 times a lower quantity of 1,800, the total revenue is \$13,500. Thus, there is a gain of \$1,400 in total revenue from raising the price.

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Learning Objective: 4.2

21. Based on the determinants of elasticity as discussed in the text, explain what the price elasticity of demand of the following products would be: (a) ballpoint pens; (b) Crest toothpaste; (c) diamond rings; (d) sugar; and (e) refrigerators.

Ans: (a) Ballpoint pens: Demand should be slightly elastic because there are substitutes, and they are not a complete necessity. However, they are not very durable and the price is small relative to most incomes, and the substitutes are not quite the same so the elasticity will not be high.

(b) Crest toothpaste: Demand should be very elastic because there are very many other brand-name substitutes, and this brand is not a necessity.

(c) Diamond rings: Demand should be elastic because there are other types of rings, the price is high relative to most incomes, they are durable, and they are a luxury item.

(d) Sugar: Demand should be inelastic because there are few close substitutes, the price is small relative to most incomes, it is not a durable good, and not usually viewed as a luxury.

(e) Refrigerators: Demand is probably somewhat elastic because the price is large relative to most incomes and they are durable so an old refrigerator can last until "the price is right." However, refrigerators are not luxuries and there are no good substitutes, so the demand is probably not very elastic with respect to price.

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Learning Objective: 4.2

22. Explain how each of four different factors can affect the price elasticity of demand. Give an example for each determinant.

Ans: First, the price elasticity of demand can be affected by the number of substitutes. In general, the larger the number of substitutes for a product, the greater will be the elasticity of demand. The price elasticity of demand for beef tends to be relatively high because there are many possible substitute sources of protein (e.g., chicken, turkey, or fish). Second, elasticity is also affected by the proportion of income spent on a product. Other things equal, the higher the price of a product relative to people's incomes (and budgets), the greater the product's elasticity of demand. Sugar has a relatively low price elasticity of demand because the cost of sugar is a minor part of a consumer's budget. By contrast, the price elasticity of demand for computers and other consumer appliances such as washing machines is relatively high because they require a large outlay from a consumer's budget. Third, luxuries will tend to be price-elastic while necessities are price-inelastic. Bread will have a low price elasticity of demand coefficient relative to that for a luxury auto. Fourth, time will influence the elasticity of demand. The greater the amount of time considered, the greater the elasticity of demand. In the short-run the demand for travel to a warm location during the winter will be less price-elastic than the demand for travel to a warm location at other times of the year.

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Learning Objective: 4.2

23. Evaluate. Farmers as a group benefit when there is good growing season. Use the concept of elasticity in your answer.

Ans: This statement is generally false. The elasticity of demand for many agricultural products is inelastic. The higher output resulting from a good growing season must be sold at significantly lower prices. Prices must fall by a larger percentage than output rises. Therefore, the incomes (total revenues) of farmers as a group are actually lower.

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Learning Objective: 4.2

24. Federal and provincial governments often seek to raise tax revenue by levying excise or sales taxes on specific products. What economic factors should be considered in determining the products that will raise the most tax revenue? Give examples of products in your answer.

Ans: Government officials should consider taxing products for which the price elasticity of demand is inelastic. Liquor, gasoline, and cigarettes are examples of goods with inelastic demand on which tax increases are imposed to raise tax revenue. When a product has an inelastic demand, an increase in taxes will increase total spending on the product and hence the revenue collected by government. There will be a negative effect on the quantity consumed, and thus employment in the industry, but the employment effects will be less harmful than if the product taxed was elastic. Taxing a product for which the demand is relatively elastic is likely to reduce tax revenue from the product and reduce significantly employment in the industry. Such a situation arose in Canada when the Federal government imposed an air security tax on flights. Passengers especially on short haul flights were more sensitive to the higher prices than the Federal government expected. As a result, revenues from the security tax were lower than expected and passenger traffic fell significantly reducing employment in the industry.

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Learning Objective: 4.2

25. Explain the perspective that tougher enforcement of drug laws for cocaine or other drug laws may actually increase the crime rate. Use the concepts of demand, supply, and elasticity in your explanation.

Ans: Tougher enforcement of drug laws reduces the supply of cocaine and other illegal drugs, thus driving up the street price. The demand for cocaine and other drugs, however, appears to be highly inelastic. The increased price will increase total revenues and profits for sellers, but at the same time it will increase total spending by drug users. To support this increased spending, drug users are likely to commit more crimes. Thus, the increased enforcement of drug laws may have the secondary effect of increasing money-producing crimes such as robbery, burglary, shoplifting, and fraud.

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Learning Objective: 4.2

26. Discuss the pros and cons of legalizing drugs such as heroin or cocaine from an economic perspective using the concepts of supply, demand, and elasticity.

Ans: The pro side for legalization looks at the price elasticity of demand for heroin and cocaine. This demand is price-inelastic which means that if the price of these drugs was reduced, there would be less spent on them by users. Legalization of these drugs will tend to increase the supply and reduce the price. The reduced price will reduce the total expenditures on these drugs. Fewer users will have to resort to crime to pay for the drugs and there would be less need for law-enforcement resources used for the “war on drugs.”

The opponents of legalization suggest that there are two types of consumers of illegal drugs — addicts and occasional users. The demand from addicts is price-inelastic as discussed above. The demand by the occasional users, however, is more price-elastic. As price falls, this type of user will spend more on these drugs. This additional consumption in turn may cause some of the occasional users to become addicts. The greater social acceptability for the use of such drugs may also increase the demand for these drugs, which would increase consumption, stimulate more addiction, and increase crime in the long run. The additional social cost from these developments would be much greater than any benefit from simple reduction of expenditures by addicts and short-term reduction in law-enforcement costs.

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Learning Objective: 4.2

27. The following data shows the relationship between price and quantity supplied at four different prices for a product:

$$P = \$11, Q_s = 30$$

$$P = \$9, Q_s = 28$$

$$P = \$7, Q_s = 24$$

$$P = \$5, Q_s = 16$$

Using the midpoints formula, what is the price elasticity of supply between: (a) \$11 and \$9; (b) \$9 and \$7; (c) \$7 and \$5?

Ans: (a) 0.34; (b) 0.62; (c) 1.2

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Learning Objective: 4.3

28. Use the supply data in the schedule shown below to complete the table by computing the price elasticity of supply coefficients between each set of prices. Indicate whether supply is elastic, inelastic or unitary at each set of prices.

<u>Price</u>	<u>Quantity supplied</u>	<u>Elasticity coefficient</u>	<u>Character of supply</u>
\$11	130	_____	_____
9	110	_____	_____
7	90	_____	_____
5	70	_____	_____
3	50	_____	_____

Ans:

<u>Price</u>	<u>Quantity supplied</u>	<u>Elasticity coefficient</u>	<u>Character of supply</u>
\$11	130	0.83	inelastic
9	110	0.80	inelastic
7	90	0.75	inelastic
5	70	0.67	inelastic
3	50		

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Learning Objective: 4.3

29. Why is there no total revenue test for elasticity of supply?

Ans: The simple answer is a semantic one; a firm's supply curve is based on costs of production, so we would have to use a "total costs" test. Also, according to the "law of supply," price and quantity are directly related, so a rise in price would always raise potential total revenue and a fall in price would always decrease potential total revenue, so the total revenue test would not be meaningful.

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Learning Objective: 4.3

30. What is the main determinant of the price elasticity of supply? Explain.

Ans: The amount of time that producers have to respond to a change in price is the main determinant. The longer the time, the easier it is for producers to shift resources into production and increase the quantity supplied. The more time the firm has to adjust to a change in price, the greater the elasticity of supply.

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Learning Objective: 4.3

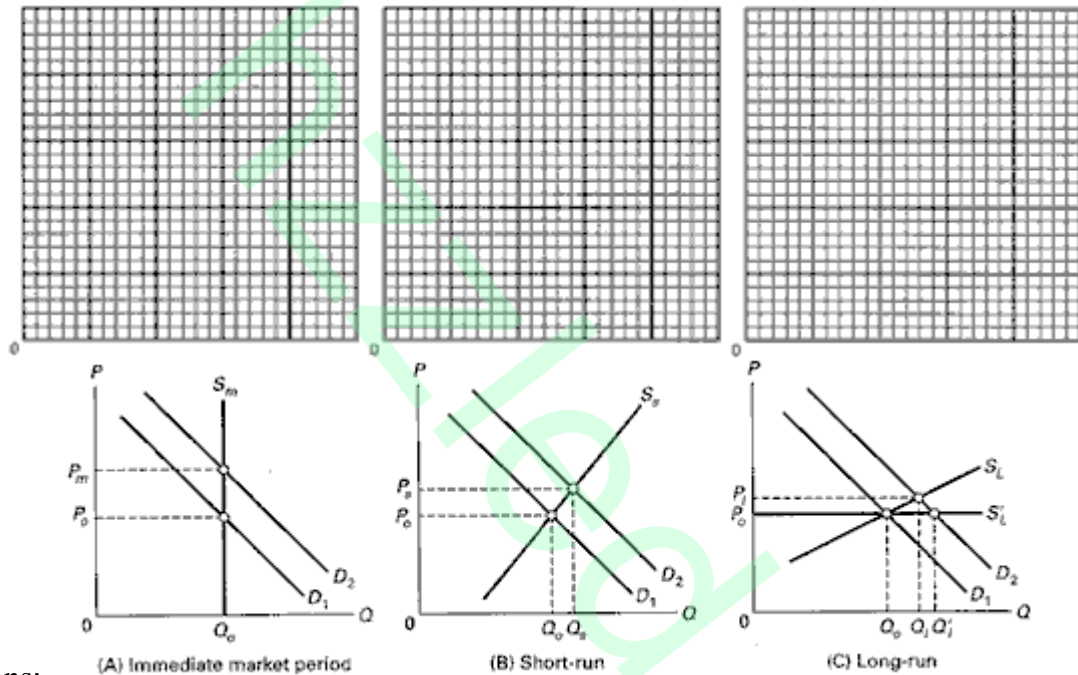
31. Describe and give reasons for the characteristics of the elasticity of supply of a farm product that is sold at a farmer's market on a particular day.

Ans: The supply is probably perfectly inelastic in this case indicating that a change in price will not bring forth more quantity supplied. The farmer has a specific quantity of the product available for sale that day. Even if the price increases, the farmer cannot increase the quantity he or she wants to sell because the market period is too short of time for a change to be made to production.

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Learning Objective: 4.3

32. Draw three supply and demand graphs that illustrate the effect of time on the elasticity of supply using the below graphs. The three graphs should show: (a) the immediate market period; (b) the short run; and (c) the long run.



Ans:

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Learning Objective: 4.3

33. Why would it be valuable for a business to know the cross elasticity of demand for the two products it produces: peanuts and popcorn?

Ans: The cross elasticity of demand shows the responsiveness of the quantity demanded for one product to a change in the price of another product. The business can use this concept to determine whether there is a substitute, complementary, or independent relationship between peanuts and popcorn. If peanuts and popcorn are substitutes, a rise in the price of peanuts will cause an increase in the quantity demanded for popcorn (the cross elasticity will be positive). On the other hand, if peanuts and popcorn are complementary goods, a rise in the price of peanuts will decrease the quantity demanded for popcorn (the cross elasticity will be negative). The business will want to know the nature of the relationship between the two products and how responsive the quantity demanded for one product is to a change in the price of the other before a price is changed. This cross elasticity information will be useful for increasing total revenue and profits.

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Learning Objective: 4.4

34. Use the information in the table below to identify the type of cross elasticity relationship between products X and Y in each of the following five cases, A to E.

<u>Cases</u>	<u>Percent change in price of Y</u>	<u>Percent change in quantity demanded of X</u>	<u>Cross elasticity type</u>
A	5	7	_____
B	9	6	_____
C	5	-5	_____
D	3	0	_____
E	-2	10	_____

Ans:

<u>Cases</u>	<u>Percent change in price of Y</u>	<u>Percent change in quantity demanded of X</u>	<u>Cross elasticity type</u>
A	5	7	substitute
B	9	6	substitute
C	5	-5	complement
D	3	0	independent
E	-2	10	complement

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Learning Objective: 4.4

35. For the following three cases, use a midpoints formula to calculate the coefficient for the cross elasticity of demand and identify the type of relationship between the two products.

(a) The quantity demanded for product A increases from 30 to 40 as the price of product B increases from \$0.10 to \$0.20.

Coefficient: _____ Relationship: _____

(b) The quantity demanded for product A decreases from 3000 to 1500 as the price of good B increases from \$5 to \$10.

Coefficient: _____ Relationship: _____

(c) The quantity demanded for product A remains 400 units as the price of product B increases from \$25 to \$30.

Coefficient: _____ Relationship: _____

Ans: (a) Coefficient: 0.43 Relationship: substitutes
(b) Coefficient: -1.00 Relationship: complements
(c) Coefficient: 0.00 Relationship: independent

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Learning Objective: 4.4

36. Use the information in the table below to identify the income elasticity type of each of the following products, A to E.

<u>Product</u>	<u>Percent change in income</u>	<u>Percent change in quantity demanded</u>	<u>Income elasticity type</u>
A	9	12	_____
B	-6	6	_____
C	3	3	_____
D	6	-3	_____
E	2	1	_____

Ans:

<u>Product</u>	<u>Percent change in income</u>	<u>Percent change in quantity demanded</u>	<u>Income elasticity type</u>
A	9	12	normal
B	-6	6	inferior
C	3	3	normal
D	6	-3	inferior
E	2	1	normal

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Learning Objective: 4.4

37. You would think that if people's income increased over time, then all industries in the economy should benefit equally, but this is not the case. Explain why and give examples.

Ans: The explanation is based on the income elasticity of demand. Those industries in the economy for which the demand is income elastic (auto, housing, and restaurants) have experienced stronger growth over the years because the percentage change in quantity demanded is greater than the percentage change in income for these normal goods. Other industries such as agriculture have experienced slower growth in output because the demand for the products produced for most agricultural goods is income inelastic. In this case, the percentage change in quantity demanded is less than the percentage change in income.

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Learning Objective: 4.4

38. What is the practical significance of income elasticity coefficients? Explain the significance using as examples an income elasticity of 3.5 for computers and an income elasticity of 0.20 for ice cream.

Ans: The income elasticity of demand roughly indicates which industries are likely to be expanding and prosperous and what industries are likely to be stagnant. The elasticity coefficient of 3.5 for the computer industry indicates that each 1% increase in income leads to a 3.5% increase in the quantity demanded for computers. This relationship bodes well for the long-term prosperity in the computer industry. Conversely, the 0.2 coefficient for ice cream indicates that a 1% increase in income leads to only 0.2 of a percent of an increase in the quantity demanded of ice cream. This low coefficient indicates that the ice cream industry will not benefit greatly from an increase in consumer incomes.

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Learning Objective: 4.4

39. What is the significance of an income elasticity of demand that is equal to 2?

Ans: An income elasticity of demand equal to 2 indicates that demand is quite responsive to income changes. More precisely, the value indicates that a 1% change in income will cause a 2% change in the quantity demanded of that product. An increase in income will lead to a greater proportion of income spent on the product.

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Learning Objective: 4.4

40. What is the significance of an income elasticity of demand that is equal to -0.25?

Ans: An income elasticity of demand equal to -0.25 indicates that this is an inferior good. More precisely, the value indicates that a 1% change in income will cause a -0.25% change in the quantity demanded of that product. An increase in income will lead to a decrease in spending on the product.

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Learning Objective: 4.4

41. Last year, 50,000 units of a product were purchased when its price was \$2 per unit. This year, incomes have increased by 3% and as a result, 60,000 units of the product are purchased at a price of \$3 per unit.

(a) What is the price elasticity of demand for this product?

(b) What is the income elasticity of demand for this product?

(c) What is the price elasticity of supply for this product?

Ans: (a) The price elasticity of demand for this product cannot be determined. The change in the quantity demanded is the result of both a change in income and a change in price. The price elasticity of demand is measured along a demand curve where the price is allowed to change but all other things, the determinants of demand, are equal.

(b) The income elasticity of demand for this product cannot be determined. The change in the quantity demanded is the result of both a change in income and a change in price. The income elasticity of demand is measured by holding all things other than income constant.

(c) If we assume that only the demand has shifted between the two years, then the price elasticity of supply for this product can be determined. Its value is .45.

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Learning Objective: 4.1, 4.4, 4.3

42. Suppose demand is perfectly elastic and supply is positively sloped. How much of a \$1 per unit tax levied on producers is paid by consumers?

Ans: When demand is perfectly elastic, the demand curve is completely horizontal. Therefore, any shift of the supply curve as a result of the excise tax will not affect the equilibrium price. Producers cannot pass any of the tax onto consumers. After paying the tax, producers receive \$1 less for each unit of their product.

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Learning Objective: 4.5

43. Suppose demand is perfectly inelastic and supply is positively sloped. How much of a \$1 per unit tax levied on producers is paid by consumers?

Ans: When demand is perfectly inelastic, the demand curve is completely vertical. Therefore, the leftward shift of the supply curve as a result of the excise tax will increase the equilibrium price by the amount of the tax. Producers pass all of the tax onto consumers. After forwarding the tax to the government, producers receive the same price for their product as before the tax.

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Learning Objective: 4.5

44. Suppose supply is perfectly elastic and demand is negatively sloped. How much of a \$1 per unit tax levied on producers is paid by consumers?

Ans: When supply is perfectly elastic, the supply curve is completely horizontal. Therefore, any shift of the supply curve as a result of the excise tax will increase the equilibrium price by the amount of the tax. Producers pass all of the tax onto consumers. After forwarding the tax to the government, producers receive the same price for their product as before the tax.

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Learning Objective: 4.5

45. Suppose supply is perfectly inelastic and demand is negatively sloped. How much of a \$1 per unit tax levied on producers is paid by consumers?

Ans: When supply is perfectly inelastic, the supply curve is completely vertical. Therefore, a vertical shift of the supply curve by the size of the tax will not affect the equilibrium price. Producers cannot pass any of the tax onto consumers. After paying the tax, producers receive \$1 less for each unit of their product.

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Learning Objective: 4.5

46. If the government wanted to raise tax revenues by imposing excise taxes of products, which products would be better candidates for taxation?

Ans: The better candidates for the tax are products such as tobacco, alcohol, gasoline and other products whose demands are inelastic. If the government levied excise taxes on products whose demands are elastic, consumption would drop significantly and very little tax revenues would be generated. By focusing on products for which demand is inelastic, the government is assured of significant revenues because the sales of such products will not fall much.

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Learning Objective: 4.5

47. In the table below are the demand and supply schedules for beer in thousands of cases.

<u>Quantity demanded (cases)</u>	<u>Price per case</u>	<u>Before-tax quantity supplied (cases)</u>	<u>After-tax quantity supplied (cases)</u>
250	\$11.60	1,000	_____
300	11.40	900	_____
350	11.20	800	_____
400	11.00	700	_____
450	10.80	600	_____
500	10.60	500	_____
550	10.40	400	0
600	10.20	300	0
650	10.00	200	0

- (a) What are the equilibrium price and quantity before a tax is imposed?
- (b) What is the price elasticity of demand at the equilibrium?
- (c) What is the price elasticity of supply at the equilibrium?
- (d) Based on your answers to (b) and (c), would buyers or sellers bear a larger portion of an excise tax?
- (e) Suppose the provincial government imposes an excise tax of \$0.60 per case of beer, what is the after- tax supply schedule?
- (f) What is the equilibrium price of beer after the tax is imposed? How much of the \$0.60 is borne by buyers and how much by sellers?

Ans:

<u>Quantity demanded (cases)</u>	<u>Price per case</u>	<u>Before-tax quantity supplied (cases)</u>	<u>After-tax quantity supplied (cases)</u>
250	\$11.60	1,000	700
300	11.40	900	600
350	11.20	800	500
400	11.00	700	400
450	10.80	600	300
500	10.60	500	200
550	10.40	400	0
600	10.20	300	0
650	10.00	200	0

- (a) The equilibrium price is \$10.60 and 500 thousand cases are bought and sold.
- (b) 5.3 $[(100/500)/(\$.40/\$10.60)]$.
- (c) 10.6 $[(200/500)/(\$.40/\$10.60)]$.

(d) Since demand is less elastic than supply, buyers would pay a larger proportion of an excise tax.

(e) *See table above.*

(f) The equilibrium price is \$11.00 and 400 thousand cases are bought and sold. \$0.40 is borne by buyers and \$0.20 is borne by sellers.

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Learning Objective: 4.1, 4.3, 4.5

48. In the table below are the demand and supply schedules for rum in thousands of litres.

<u>Quantity demanded (litre)</u>	<u>Price per litre</u>	<u>Befor-tax quantity supplied (litre)</u>	<u>After-tax quantity supplied (litre)</u>
200	6.75	1,000	_____
300	6.50	900	_____
400	6.25	800	_____
500	6.00	700	_____
600	5.75	600	_____
700	5.50	500	0
800	5.25	400	0
900	5.00	300	0

- (a) What are the equilibrium price and quantity before a tax is imposed?
- (b) What is the price elasticity of demand at the equilibrium?
- (c) What is the price elasticity of supply at the equilibrium?
- (d) Based on your answers to (b) and (c), would buyers or sellers bear a larger portion of an excise tax?
- (e) Suppose the provincial government imposes an excise tax of \$1.00 per litre of rum, what is the after-tax supply schedule?
- (f) What is the equilibrium price of rum after the tax is imposed? How much of the \$1.00 is borne by buyers and how much by sellers?

Ans:

<u>Quantity demanded (litre)</u>	<u>Price per litre</u>	<u>Befor-tax quantity supplied (litre)</u>	<u>After-tax quantity supplied (litre)</u>
100	\$7.00	1,100	700
200	6.75	1,000	600
300	6.50	900	500
400	6.25	800	400
500	6.00	700	300
600	5.75	600	0
700	5.50	500	0
800	5.25	400	0
900	5.00	300	0

- (a) The equilibrium price is \$5.75 and 600 thousand litres are bought and sold.
- (b) $3.8 [(200/600)/(\$.50/\$5.75)]$.
- (c) $3.8 [(200/600)/(\$.50/\$5.75)]$.

(d) Since demand and supply are equally elastic, an excise tax would be split evenly between buyers and sellers.

(e) *See table above.*

(f) The equilibrium price is \$6.25 and 400 thousand litres are bought and sold. \$0.50 is borne by the seller and \$0.50 is borne by the buyer.

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Learning Objective: 4.1, 4.3, 4.5

49. What is consumer surplus?

Ans: Consumer surplus is a measure of an individual's net benefit from consuming a product and is used in cost-benefit analysis. It is equal to the difference between the maximum amount that the consumer is willing to pay and the actual amount the consumer must pay.

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Learning Objective: 4.6

50. How is consumer surplus derived from a demand curve?

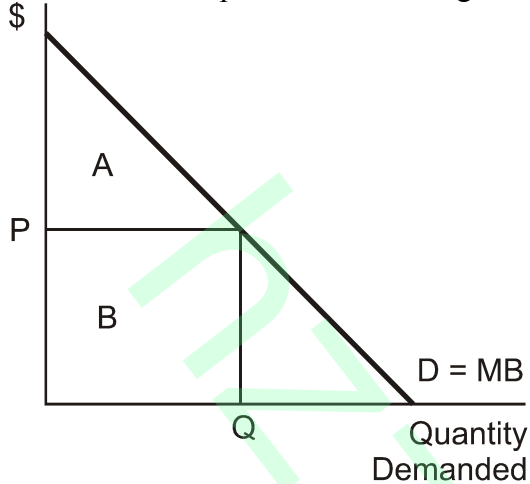
Ans: Consumer surplus is the area under the demand curve and above the market price.

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Learning Objective: 4.6

51. Draw a market demand curve and indicate the following:

- (a) The market price;
- (b) The quantity demanded;
- (c) The maximum amount that buyers are willing to pay for the quantity demanded;
- (d) The actual amount that buyers must pay for the quantity demanded;
- (e) The consumer surplus from obtaining the quantity demanded.



Ans:

See graph above (a) P, (b) Q, (c) area A+B, (d) area B, (e) area A.

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Learning Objective: 4.6

52. Demand in a market is represented by the equation, $P = 50 - Q_D$. Suppose the market price is \$30.

- (a) How many units do buyers wish to purchase in this market?
- (b) What is the maximum amount that the buyers are willing to pay for this quantity of output?
- (c) What is the actual amount that buyers have to pay for this quantity of output?
- (d) What is the consumer surplus that buyers obtain from purchasing this quantity of output?

Ans: (a) 20 units; (b) \$800 [$.5(\$50 - \$30) \times 20 + \30×20]; (c) \$600 ($\30×20); (d) \$200.

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Learning Objective: 4.6

53. Demand in a market is represented by the equation, $P = 30 - .5Q_D$. Suppose the market price is \$18.

- (a) How many units do buyers wish to purchase in this market?
- (b) What is the maximum amount that the buyers are willing to pay for this quantity of output?
- (c) What is the actual amount that buyers have to pay for this quantity of output?
- (d) What is the consumer surplus that buyers obtain from purchasing this quantity of output?

Ans: (a) 24 units; (b) \$576 $[.5(\$30 - \$18) \times 24 + \$18 \times 24]$; (c) \$432 $(\$18 \times 24)$; (d) \$144.

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Learning Objective: 4.6

54. What is producer surplus?

Ans: Producer surplus is the difference between what sellers receive for their product and the marginal cost of producing the product.

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Learning Objective: 4.6

55. How is producer surplus derived from a supply curve?

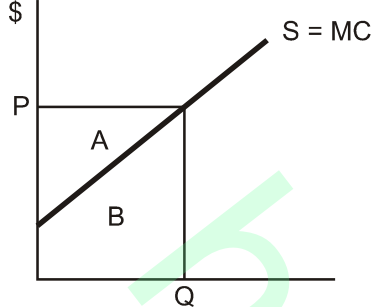
Ans: Producer surplus is the area above the supply curve and below the market price.

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Learning Objective: 4.6

56. Draw a market supply curve and indicate the following:

- (a) The market price;
- (b) The quantity supplied;
- (c) The minimum amount that sellers are willing to accept for the quantity supplied;
- (d) The actual amount that sellers receive for providing the quantity supplied;
- (e) The producer surplus from providing the quantity supplied.



Ans: Quantity Supplied

See graph above (a) P, (b) Q, (c) area B, (d) area A+B, (e) area A.

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Learning Objective: 4.6

57. Supply in a market is represented by the equation, $P = 20 + .1Q_s$. Suppose the market price is \$30.

- (a) How many units do sellers wish to provide in this market?
 - (b) What is the minimum amount that sellers are willing to accept for this quantity of output?
 - (c) What is the actual amount that sellers receive for providing for this quantity of output?
 - (d) What is the producer surplus that sellers obtain for providing this quantity of output?
- Ans: (a) 100 units; (b) \$2500 $[.5(\$30 - \$20) \times 100 + \$20 \times 100]$; (c) \$3000 $(\$30 \times 100)$; (d) \$500.

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Learning Objective: 4.6

58. Supply in a market is represented by the equation, $P = 5 + .1Q_s$. Suppose the market price is \$30.

- (a) How many units do sellers wish to provide in this market?
 - (b) What is the minimum amount that sellers are willing to accept for this quantity of output?
 - (c) What is the actual amount that sellers receive for providing for this quantity of output?
 - (d) What is the producer surplus that sellers obtain for providing this quantity of output?
- Ans: (a) 250 units; (b) \$4375 [$.5(\$30 - \$5) \times 250 + \5×250]; (c) \$7500 ($\30×250); (d) \$3125.

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Learning Objective: 4.6

59. How are producer surplus and economic profit related?

Ans: Profit is equal to total revenue less total costs. Total cost can be further broken down into total variable cost and total fixed cost. In equation form:
 $\pi = TR - (TVC + TFC) = TR - TVC - TFC$. At a production level of Q, a firm's producer surplus is the difference between its total revenues and the sum of its marginal costs (or its total variable costs). This means we can replace TR-TVC in our above equation with PS $\rightarrow \pi = PS - TFC$ or $PS = \pi + TFC$ (producer surplus is equal to the sum of economic profit and total fixed cost).

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Learning Objective: 4.6

60. Demand is represented by the equation, $P=20-0.2Q_D$ and supply by the equation $P=5+0.1Q_S$.

(a) Suppose this market produces 40 units of output. What price would this output be sold at? What is the marginal benefit to society of the 40th unit? What is the marginal cost of the 40th unit?

(b) What is consumer surplus if the market produces 40 units of output? What is producer surplus? What is the sum of consumer and producer surplus?

(c) What are the equilibrium price and quantity?

(d) What is consumer surplus at equilibrium? What is producer surplus? What is the sum of consumer and producer surplus?

(e) Is allocative efficiency achieved when the market produces 40 units of output? Explain in three different ways.

Ans: (a) The price is \$12 [$20-0.2(40)$]. The marginal benefit is \$12. The marginal cost is \$9 [$5+0.1(40)$].

(b) Consumer surplus is \$160 [$0.5(\$20-\$12) \times 40$]. Producer surplus is \$200 [$0.5(\$9-\$5) \times 40 + (\$12-\$9) \times 40$]. The sum of consumer and producer surplus is \$360.

(c) The equilibrium price and quantity are \$10 and 50 units.

(d) Consumer surplus is \$250 [$0.5(\$20-\$10) \times 50$]. Producer surplus is \$125 [$0.5(\$10-\$5) \times 50$]. The sum of consumer and producer surplus is \$375.

(e) Allocative efficiency is achieved when $P = MC$, when $MB = MC$, and when the sum of consumer and producer surplus is maximized. When 40 units of output are produced, P , which is \$12, exceeds MC , which is \$9. Also, MB , which is \$12, exceeds MC , which is \$9. Finally, the sum of consumer and producer surplus is \$360. However, this sum is not maximized. The sum can be as large as \$375. Therefore, on all three bases, allocative efficiency is not achieved at 40 units of output. There is an underallocation of resources to this industry. By shifting resources to this industry and increasing output to 50 units, allocative efficiency is achieved.

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Learning Objective: 4.6

61. Demand is represented by the equation, $P=200-2Q_D$ and supply by the equation $P=25+3Q_S$.

(a) Suppose this market produces 30 units of output. What price would this output be sold at if consumers were going to buy all goods? What is the marginal benefit to society of the 30th unit? What is the marginal cost of the 30th unit?

(b) What is consumer surplus if the market produces 30 units of output? What is producer surplus? What is the sum of consumer and producer surplus?

(c) What are the equilibrium price and quantity?

(d) What is consumer surplus at equilibrium? What is producer surplus? What is the sum of consumer and producer surplus?

(e) Is allocative efficiency achieved when the market produces 30 units of output? Explain in three different ways.

Ans: (a) The price is \$140 [$200-2(30)$]. The marginal benefit is \$140. The marginal cost is \$115 [$25+3(30)$].

(b) Consumer surplus is \$900 [$0.5(\$200-\$140) \times 30$]. Producer surplus is \$2100 [$0.5(\$115-\$25) \times 30 + (\$140-\$115) \times 30$]. The sum of consumer and producer surplus is \$3000.

(c) The equilibrium price and quantity are \$130 and 35 units.

(d) Consumer surplus is \$1225 [$0.5(\$200-\$130) \times 35$]. Producer surplus is \$1837.50 [$0.5(\$130-\$25) \times 35$]. The sum of consumer and producer surplus is \$3062.50.

(e) Allocative efficiency is achieved when $P = MC$, when $MB = MC$, and when the sum of consumer and producer surplus is maximized. When 30 units of output are produced, P , which is \$140, exceeds MC , which is \$115. Also, MB , which is \$140, exceeds MC , which is \$115. Finally, the sum of consumer and producer surplus is \$3000. However, this sum is not maximized. The sum can be as large as \$3062.50. Therefore, on all three bases, allocative efficiency is not achieved at 30 units of output. There is an underallocation of resources to this industry. By shifting resources to this industry and increasing output to 35 units, allocative efficiency is achieved.

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Learning Objective: 4.6

62. Give three examples where one group of individuals is charged a higher price for the same product or service than another group? What is the seller's motivation for doing so and how does the seller choose which group to charge with a higher price?

Ans: Differential prices are charged to different travelers on airlines, children and seniors are charged different prices than adults and poor students are charged lower tuition than wealthier students. This price discrimination is motivated by the desire of sellers to enhance their profits. They single out the groups with more inelastic demand curves to be charged higher prices.

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Learning Objective: Last Word