How to Study for Chapter 4   The Law of Demand

Chapter 4 introduces the **law of demand** and the principle of **"elasticity"**.

1. Begin by looking over the Objectives listed below. This will tell you the main points you should be looking for as you read the chapter.

2. New words or definitions are highlighted in italics and in red color. Other key points are highlighted in bold type and in blue color.

3. You have another graph in this chapter. Be sure to go over every point so that you can see how they are derived. Be sure that you can **explain in your own words** why the curve has the shape that it does (and how this shape relates to elasticity).

4. You will be given an In Class Assignment and a Homework assignment to illustrate the two main concepts of this chapter. When you have finished the text, the Test Your Understanding questions, and the assignments, go back to the Objectives. See if you can answer the questions without looking back at the text. If not, go back and re-read that part of the text. When you are ready, try the practice quiz for Chapter 4 at the end of the chapter.

Objectives for Chapter 4   The Law of Demand

At the end of Chapter 4, you will be able to **define the following terms**:

Demand
Law of Demand
Demand Schedule
Demand Curve (and draw the curve)
Price Elasticity of Demand
Relatively Inelastic Demand
Relatively Elastic Demand
Unit Elastic Demand
Perfectly Inelastic Demand
Perfectly Elastic Demand
Total Revenue

At the end of Chapter 4, you will also be able to answer the following:

(1) Explain what will happen to total revenue if the price rises and demand is
relatively inelastic, (2) relatively elastic, or (3) unit elastic

(2) Name the factors that determine whether the demand for a given product will
Be relatively elastic or relatively inelastic.

Chapter 4   The Law Of Demand (Most recent revision June 2004)

    As already noted, markets are places (physical or otherwise) where buyers come to buy and sellers come to sell. In this chapter, we shall focus on the quantity of a given product that buyers wish to buy --- called the *demand*. What factors explain the quantity demanded of a given product by buyers?

    One of the key factors is certainly the *price of the product*. Think of buying soft drinks. You go into the market. A six-pack sells for $1.99. You buy a given number --- say two six-packs. Next week, there is a sale --- the price is $0.99 a six-pack. You stock up and buy five six-packs. The following week, the price has risen to $2.99 per six-pack. This is just too expensive --- you don't buy any. The result is familiar to anyone who shops for anything regularly. We can generalize it with the following statement: *as the price of the product rises (falls), the quantity demanded of that product falls (rises).* The statement is typically referred to as the *law of demand*. While one can perhaps think of an exception (if the price of a life saving drug that has no substitute rises, what would happen to your quantity demanded?), they are so few that we can assume safely that the statement is true in all cases.

The following *demand schedule* for new homes illustrates the law of demand:

	Price	Quantity Demanded Per Month
	$340,000	0
1	$320,000	1000
2	$300,000	2000
3	$280,000	3000
4	$260,000	4000
5	$240,000	5000
6	$220,000	6000
7	$200,000	7000
8	$180,000	8000
9	$160,000	9000
10	$140,000	10000
11	$120,000	11000

    Note that, in this example, at any price above $320,000, no one will buy any homes. Then, as the price falls, people buy more homes in the month. We can then picture this in the graph on the next page. The graph allows us to analyze more clearly because we can see visually what is occurring. Notice the **downward-sloping line**. As the price of homes falls, people buy more homes.

Test Your Understanding
Form in a group. Assume that you are planning to attend Palomar College next semester. Individually, determine how many units you would take if the fee per unit is as given. Then, add up the total number of units for all members of the group.

FEE PER UNIT	YOU	GROUP TOTAL
$ 0	_____	_____
$ 5	_____	_____
$15	_____	_____
$24	_____	_____
$50	_____	_____
$100	_____	_____
$500	_____	_____
$1,000	_____	_____

The law of demand tells us some information that is useful. If we, as a company, charge a higher price, people will buy less of our product. But this information is not enough. We want to know precisely what will happen to the quantity demanded of our product if we raise the price by a given amount.   In particular, we want to know what is called the *price elasticity of demand*. As a formula, this is:

Percentage Change in Quantity Demanded
Percentage Change in Price

In words, this is the percentage change in the quantity demanded of a given product that results because of a given percentage change in the price of that product. It measures how much buyers respond to a percentage change in the price. (Notice that we use "percentage change" instead of "change in amount". This allows us to compare different products. People will respond much differently to a ten cent increase in the price of a candy bar than to a ten cent increase in the price of an automobile. So we measure the change in percentage terms to allow comparison.)

When we calculate our formula, we get a number. (The number is actually negative, but we will ignore the minus sign.) *If the number is more than zero but less than one, we say that demand is relatively inelastic.* This means that buyers reduce their buying, but very little, as the price of the product rises. *If the number is more than one, we say that demand is relatively elastic.* This means that buyers not only reduce their buying, but they reduce it considerably, as the price rises. *If the number exactly equals one, we say that demand is unit elastic.* "Unit" means one. *If the number exactly equals zero, we say that demand is perfectly inelastic.*   This means that buyers do not change their quantity demanded at all if the price rises. Perfectly inelastic demand would be a violation of the law of demand. We shall not encounter any examples of perfectly inelastic demand. *Finally, if the number is infinitely large, we say that the demand is perfectly elastic.* We shall encounter several examples of this. It means that the market is infinitely large; the seller can sell as much as he or she wants at the price that exists in the market.
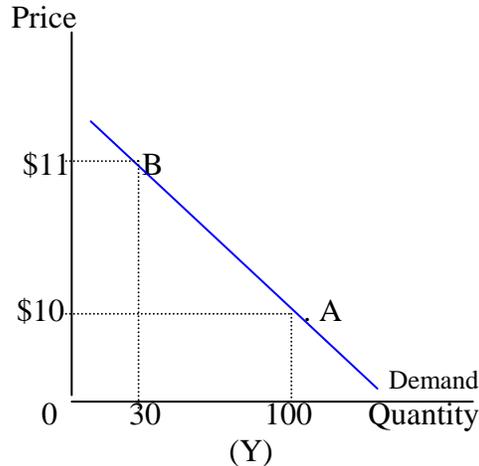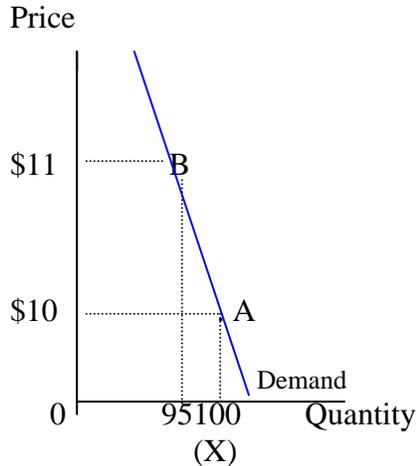
DEMAND CURVE
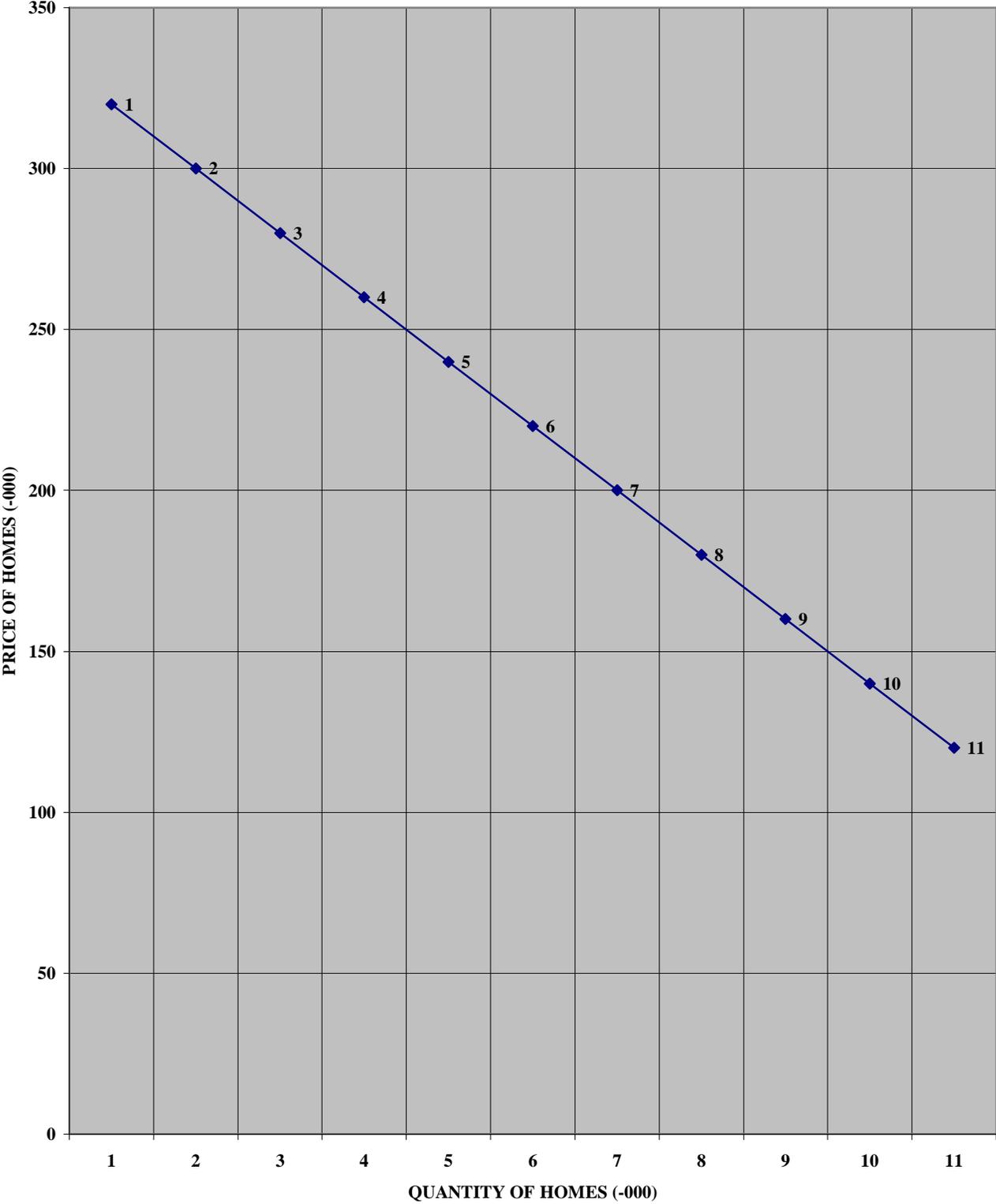
In summary, <u>If the number is:</u>   <u>Demand is:</u>

If the number is:	Demand is:
Between 0 and 1	Relatively Inelastic
Greater than 1	Relatively Elastic
=1	Unit Elastic
=0	Perfectly Inelastic
Infinitely Large	Perfectly Elastic

Remember that the demand curve was drawn as a downward-sloping line. Below are two demand curves for two different products, X and Y. Both are downward-sloping lines. For which of the two is the demand relatively inelastic?

Price   Price

$11   B $11   B

$10   A $10   A

                   Demand   Demand

0   95 100   Quantity   0   30   100   Quantity

         (X)   (Y)

The answer is X. In both cases, the price starts at $10 and the quantity demanded is 100 (Point A). In both cases, the price rises to $11. For X the quantity demanded only falls to 95 while for Y the quantity demanded falls to 30 (Point B). The demand for X is more inelastic than the demand for Y. Or we can say it differently: the demand for Y is more elastic than the demand for X. We can generalize: *the more inelastic (elastic) is the demand for the product, the steeper (flatter) is the demand curve*.

Below are two graphs. Which represents **perfectly inelastic demand** and which represents **perfectly elastic demand**?

Price   Demand   Price

                                                  Demand

0   (X)   Quantity   0   (Y)   Quantity
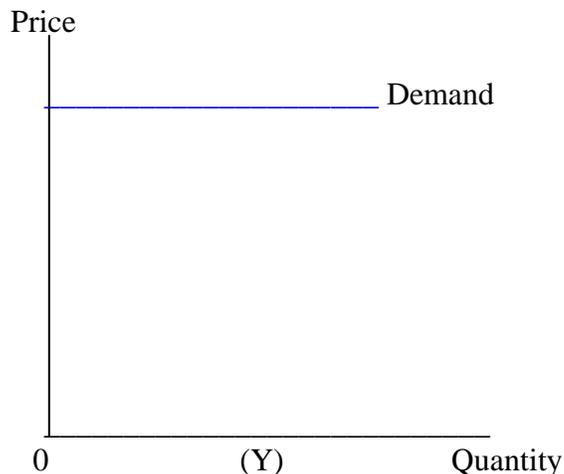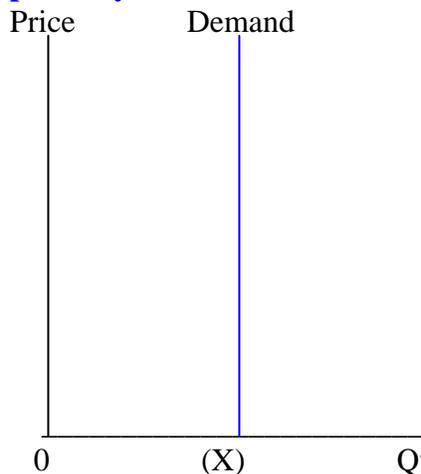
The answer is that **X (the vertical line) represents perfectly inelastic demand**. The quantity demanded stays the same regardless of the price. **Y (the horizontal line) represents perfectly elastic demand**. At the given price, the company can sell all it desires.

Test Your Knowledge
Answer the following questions without referring back.
1. To calculate the price elasticity of demand, you divide the _____ by the _____.
2. If the elasticity number is between zero and one, we say the demand is _____.
3. If the elasticity number is more than one, we say the demand is _____.
4. If the elasticity number is one, we say the demand is _____.
5. If the elasticity number is zero, we say the demand is _____.
6. If the demand for A is more inelastic than the demand for B, the graph of the demand for A would be drawn _____ (flatter or steeper?)
7. If the demand for A is perfectly elastic, the graph of the demand for A would be drawn _____.

   The dividing line between relatively inelastic demand and relatively elastic demand occurs when the number is equal to one (unit elastic demand). There is a reason for this. The reason has to do with total revenue. ***Total revenue is the amount of money received from selling the product. It is the product of price times quantity.*** (In the first graph, if the price is $10 and the quantity demanded is 100, the total revenue is $1,000.) If the price rises, what will happen to the total revenue? The answer depends on the price elasticity of demand. If the demand is **relatively inelastic**, the number is less than one. For this to occur, **the percentage change in the price must be greater than the percentage change in the quantity demanded** (review the formula). Since the price is rising and the quantity demanded is falling, the fact that the percentage change in the price is greater than the percentage change in the quantity demanded means that **total revenue must be rising**. Using the numbers above, if the price rises to $11, the quantity demanded falls only to 95, and the total revenue rises to $1,045 ($11 x 95). On the other hand, if the demand is **relatively elastic**, the number must be greater than one. This means that **the percentage change in the quantity demanded must be greater than the percentage change in the price** (again, review the formula). Since the quantity demanded is falling and the price is rising, the fact that the percentage change in the quantity demanded is greater than the percentage change in the price means that the **total revenue must fall**. Using the numbers above, if the price rises to $11, quantity demanded falls to 30. Total revenue falls to $330 ($11 x 30). Finally, assume that the demand is **unit elastic**. Since the number equals one, the **percentage change in quantity demanded must be the same as the percentage change in the price.** The result is that, if the price rises, the **total revenue stays the same.** (If the price rises to $11, quantity demanded falls to about 91. Total revenue stays $1,000.)

In summary, if the price rises (falls), and demand is:
> ***relatively inelastic, total revenue rises (falls).***
> ***relatively elastic,   total revenue falls (rises).***
> ***unit elastic, total revenue stays the same.***

   This point is commonly misunderstood by businesses. Businesses tend to assume that the demand for their products is relatively inelastic. (Often, they assume that the demand for their products is perfectly inelastic.) They believe that, if they raise the price, they will take in more revenues. This is often not the case. As one example, until the early 1980s, the airlines

(American Airlines, Delta Airlines, United Airlines, and so forth) were regulated by an agency of the government, the Civil Aeronautics Board (CAB). A purpose of the regulations was to keep airlines prices high. In the late 1970s, there was a proposal to eliminate the regulations. The large airlines believed (correctly) that the end of the regulations would means lower airline prices. They also believed that this would mean lower airline revenues (that is, the assumed that the demand for airline travel was relatively inelastic). Despite opposition from the large airline companies, the proposal was accepted and the regulations were eliminated. As expected, the airline prices fell. But, total revenues rose considerably. This means that the demand for airline travel was actually relatively elastic. The airline companies had fought to prevent something that turned out to be very good for them.

Another example involves the San Diego baseball team in the early 1990s. The team was consistently bad and consistently operated at a loss. Attendance was low. The team owners had several options. They could have tried to have a better team (which, of course, they finally did). However, they could not afford the best players. They could have tried to market the product by having promotions, better hot dogs, and so forth. They did this but, with such a bad team, it had only a small effect on attendance. Or they could have tried to lower costs by getting rid of the most expensive players. Finally, they could have raised their prices. They chose these last two alternatives. They never considered another alternative: lower the price to fill up the empty seats. Like airline travel, the demand for baseball is very elastic. Lowering the prices might have increased attendance considerably. The team put a tarp around the upper deck, admitting that they could not sell these tickets. But at $5 or less, someone might buy them. $5 would be better than zero and total revenues would have been larger. The possibility of lowering prices to increase total revenues seems to have never entered the minds of team owners. In late 1994, they sold the team.

A similar example occurred for Mills College, a small women's liberal arts college in Oakland. Faced with a low enrollment and low revenues, the college considered a major change --- admitting men. Protests were extensive, ultimately leading to the resignation of the college President. The college then decided that enrollment must grow to 1000 or men would be allowed in as students. Somehow the college trustees have never considered the possibility that enrollment is low because the fees are so high. Lowering the fees they charge might actually increase total revenues, allowing the college to survive as the only women's college in the West.

These examples illustrate that it is important to know if the demand for your product is relatively inelastic or relatively elastic. One can do detailed statistical studies. But these are expensive to do and may not be totally accurate. However, if one knows that factors that determine whether demand for a particular good is relatively inelastic or relatively elastic, one can make a good guess as to what the true number is likely to be. There are three such factors.

First, consider the demand for **electricity**? Is this demand likely to be relatively elastic or relatively inelastic (that is, if the price of electricity rises by 10%, will the quantity demanded fall very little or fall greatly)? Now consider the demand for **baseball tickets**. Is this demand likely to be relatively elastic or relatively inelastic (that is, if the price of baseball tickets rises by 10%, will the quantity demanded fall very little or fall greatly)? Most likely you said that the demand for electricity is relatively inelastic and the demand for baseball tickets is relatively elastic. (If

you did not say this, go back and review the definitions.) What accounts for the difference? The answer is substitutes available --- *how many substitutes are there and how close are they as substitutes?* If the price of electricity rises, what will buyers do? They can reduce their buying by turning off the lights, closing the refrigerator door, insulating their homes, and so forth. But these options are limited. There are simply not good substitutes for electricity. People will reduce their buying very little, making the demand relatively inelastic. If the price of baseball tickets rises, what will buyers do? They can reduce their buying greatly because there are many substitutes for baseball tickets --- movies, beach, parks, camping, television, watching baseball on TV, and so forth. Therefore, the demand for baseball tickets is relatively elastic.

Consider the demand for **telephone services**. Is this demand relatively elastic or inelastic? Many would probably say inelastic, but this is not so. The answer is confusing because of the unusual way we pay for local telephone service (a fixed fee with no additional charge within a given geographic area). Assume that we pay, instead, for the telephone through message units. This means that we pay more the longer we talk and the farther away is the other party (as we do for long distance). Now, is the demand is relatively elastic or inelastic? (If the telephone rates rise, will you talk for a little less time or for much less time?) Most people will reduce their time on the telephone considerably, making the demand relatively elastic. If we have to pay for each call, we will simply not make them. Or we will keep them to only a few minutes. **The point is that the substitute involved does not have to be a different product. It might be "do nothing".** In this case, "not calling" is a good substitute for using the telephone.

After substitutes, a second factor affecting the price elasticity of demand is time. By this we mean the time to develop substitutes. Suppose that, in the last hour, the price of gasoline rose to $5 per gallon. Your tank is almost empty. What will you do today? The answer is that you will probably fill your tank, pay the higher price, and complain loudly. But as time goes on, you will find ways to substitute. You will change your driving habits. You will arrange car-pooling. You may even buy a bicycle for shorter trips. Given a long enough time, you will buy a new car that gets much better gasoline mileage (perhaps a hybrid).

A third of the factors affecting the price elasticity of demand is the price of the product in relation to one's income. More loosely, we are asking *how expensive is the product*. People will respond more to an increase in the price of an expensive product than an inexpensive one. Assume that the price of a can of Pepsi Cola in the machine rises by 8%. This would be a dime. For most people, a dime is not much money. If you want the Cola, you will just pay the higher price. Quantity demanded will fall slightly. Now assume that the price of an automobile rises by the same 8%. On an average car, this would be over $1,200. For most people, this is expensive. People are more likely to considerably reduce their buying of cars.

Because of this last point, we need to re-examine the shape of the demand curves. Earlier, it was said that, if demand were relatively inelastic, the demand curve would be steeper and, if demand were relatively elastic, the demand curve would be flatter. However, because of the third factor affecting elasticity, the elasticity of demand changes as we move along the demand curve. *At low prices, the demand is likely to be relatively inelastic because the product is not expensive. As the price rises, the demand will become more and more elastic.*

Price
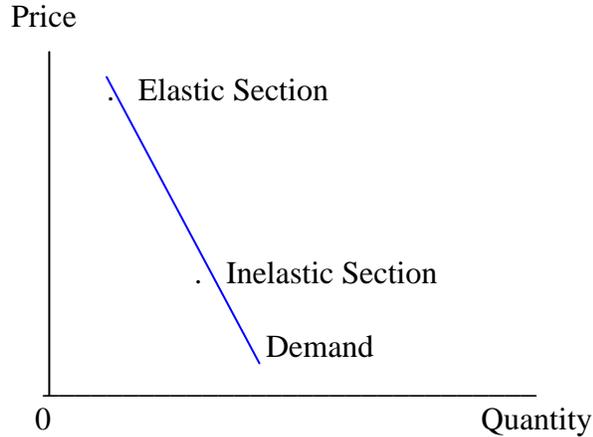
    Consider cigarettes. Is the demand relatively elastic or inelastic? Most would answer "relatively inelastic" on the basis that people are "hooked" and cannot quit easily. Cigarettes currently sell for about $4 a pack. Imagine what would occur if the price rose to $5. to $10. to $20. As the price of cigarettes become very expensive, we suspect that people would find a way to quit, or at least cut down. ***Thus, as the price rises, the demand has become relatively more elastic***. (Question: why would the demand for cigarettes be more elastic for people age 13 than for people age 40?)

    Let us summarize. ***The demand for a given product will be relatively more elastic (buyers will respond more if the price rises) if:***
    (1) there are many good substitutes for the product, including doing without
    (2) there is a longer time under consideration
   ***(3) the price of the product is relatively high is relation to buyers' incomes.***
The reverse would cause the demand to be relatively more inelastic.

Test Your Understanding.
1. Earlier it was argued that the demand for airline travel was relatively elastic. Explain why this would be so using the three factors discussed in this section.
2. The case of Mills College was described earlier. Would the demand for this type of college be relative elastic or inelastic? Use the three factors to explain why.
3. In 2003, Governor Schwartzeneggar raised the fees at community colleges from $11 per unit to $24 per unit to increase revenues. Is the demand for community college courses relatively elastic or relatively inelastic? Use the three factors to explain why.
4.   The Post Office raised the price of a first class stamp from 33 cents to 37 cents. In this range, is the demand to send a first class letter relatively elastic or relatively inelastic? Why?
5. In each case, state whether you believe the demand for the product is relatively elastic or relatively inelastic? Then, provide reasons for your conclusion.
    a. Services of a doctor to fix a broken arm
    b. Services of a doctor for plastic surgery (changing one's appearance)
    c. A new BMW $100,000 automobile
    d. Beer
    e. Gasoline
    f. Wheat used to make bread

Practice Quiz for Chapter 4

1. The **law of demand** states that:
   a. as the quantity demanded rises, the price falls   c. as income rises, the demand for the product rises
   b. as the price rises, the quantity demanded falls   d. as supply rises, the demand rises

2. The demand curve normally slopes
   a. down to the right   b. up to the right   c. horizontally   d. vertically

3. The **price elasticity of demand** is the:
   a. percentage change in quantity demanded divided by the percentage change in price
   b. percentage change in price divided by the percentage change in quantity demanded
   c. dollar change in quantity demanded divided by the dollar change in price
   d. percentage change in quantity demanded divided by the percentage change in quantity supplied

4. If the **price elasticity of demand** equals 0.5, the demand for the product is:
   a. relatively inelastic   c. perfectly inelastic   b. relatively elastic   d. unit elastic

5. Community Colleges desired to increase revenues. They decided to raise fees paid by students with Bachelors degrees to $50 because they believed this would result in greater revenues. Therefore, the Community Colleges must have believed that the demand for Community College courses by people with Bachelors degrees is:
   a. relatively inelastic   b. unit elastic   c. relatively elastic   d. perfectly elastic

6. The demand for a product would be **more inelastic**:
   a. the longer is the time under consideration
   b. the greater is the number of substitutes available to buyers
   c. the less expensive is the product in relation to incomes
   d. all of the above

7. The following is a demand curve for a product. At which point along this demand curve is the demand for the product likely to be **most elastic**?   (Hint: the elasticity is related to how expensive the product is)

Price

C

B

A

Demand

0   Quantity Demanded
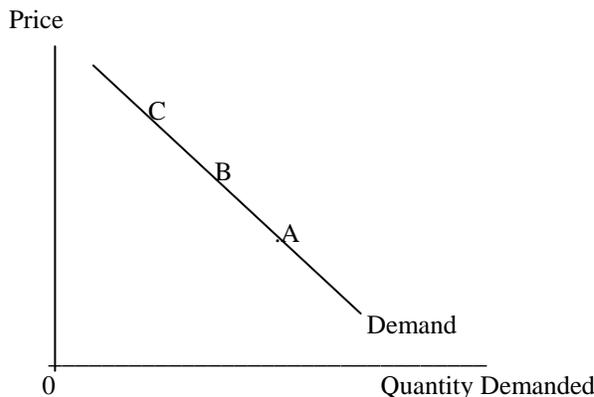
8. If the demand for a product is **unit elastic** and the price rises, the total revenue will
   a. rise   b. fall   c. stay the same

9. For which of the following products would the demand be **most elastic**?
   a. hamburger   b. beef   c. meat   d. food

10. In drawing the demand curve, if the demand for the product is more **inelastic**, you would draw the line:
    a. flatter   b. steeper

Answers   1. B 2. A 3. A 4. A 5. A 6. C 7. C 8. C 9. A 10. B