9. Income elasticity of demand indicates the responsiveness of consumer purchases to a change in income. The coefficient of income elasticity of demand is found by the formula

$$E_i = \frac{\text{percentage change in quantity demanded of X}}{\text{percentage change in income}}$$

The coefficient is positive for normal goods and negative for inferior goods.

10. Industries that sell products which have high income elasticity of demand coefficients are particularly hard hit by recessions. Those with products that have low or negative income elasticity of demand coefficients fare much better.

Terms and Concepts

price elasticity of demand
midpoint formula
elastic demand
inelastic demand
unit elasticity
perfectly inelastic demand
perfectly elastic demand
total revenue (TR)
total-revenue test
price elasticity of supply
market period
short run
long run
cross elasticity of demand
income elasticity of demand

Questions

1. Explain why the choice between 1, 2, 3, 4, 5, 6, 7, and 8 "units," or 1000, 2000, 3000, 4000, 5000, 6000, 7000, and 8000 movie tickets, makes no difference in determining elasticity in Table 4.1. LO1
2. Graph the accompanying demand data, and then use the midpoint formula for E_d to determine price elasticity of demand for each of the four possible $1 price changes. What can you conclude about the relationship between the slope of a curve and its elasticity? Explain in a nontechnical way why demand is elastic in the northwest segment of the demand curve and inelastic in the southeast segment. LO1

Product Price	Quantity Demanded
$5	1
4	2
3	3
2	4
1	5

3. What are the major determinants of price elasticity of demand? Use those determinants and your own reasoning in judging whether demand for each of the following products is probably elastic or inelastic: (a) bottled water; (b) toothpaste, (c) Crest toothpaste, (d) ketchup, (e) diamond bracelets, (f) Microsoft's Windows operating system. LO1
4. What effect would a rule stating that university students must live in university dormitories have on the price elasticity of demand for dormitory space? What impact might this in turn have on room rates? LO1
5. Calculate total-revenue data from the demand schedule in question 2. Graph total revenue below your demand curve. Generalize about the relationship between price elasticity and total revenue. LO2
6. How would the following changes in price affect total revenue? That is, would total revenue increase, decrease, or remain unchanged? LO2
   a. Price falls and demand is inelastic.
   b. Price rises and demand is elastic.
   c. Price rises and supply is elastic.
   d. Price rises and supply is inelastic.
   e. Price rises and demand is inelastic.
   f. Price falls and demand is elastic.
   g. Price falls and demand is of unit elasticity.
7. In 2006, Willem de Kooning's abstract painting *Woman III* sold for $137.5 million. Portray this sale in a demand and supply diagram and comment on the elasticity of supply. Comedian George Carlin once mused, "If a painting can be forged well enough to fool some experts, why is the original so valuable?" Provide an answer. LO3
8. Suppose the cross elasticity of demand for products A and B is +3.6 and for products C and D is −5.4. What can you conclude about how products A and B are related? Products C and D? LO4
9. The income elasticities of demand for movies, dental services, and clothing have been estimated to be +3.4, +1, and +.5, respectively. Interpret these coefficients. What does it mean if an income elasticity coefficient is negative? LO4
10. Research has found that an increase in the price of beer would reduce the amount of marijuana consumed. Is cross elasticity of demand between the two products positive or negative? Are these products substitutes or complements? What might be the logic behind this relationship? LO4
11. **LAST WORD** What is the purpose of charging different groups of customers different prices? Supplement the three broad examples in the Last Word with two additional examples of your own. Hint: Think of price discounts based on group characteristics or time of purchase.

Problems

1. Look at the demand curve in Figure 4.2a. Use the midpoint formula and points *a* and *b* to calculate the elasticity of demand for that range of the demand curve. Do the same for the demand curves in Figures 4.2b and 4.2c using, respectively, points *c* and *d* for Figure 4.2b and points *e* and *f* for Figure 4.2c. **LO1**
2. Investigate how demand elastiticities are affected by increases in demand. Shift each of the demand curves in Figures 4.2a, 4.2b, and 4.2c to the right by 10 units. For example, point *a* in Figure 4.2a would shift rightward from location (10 units, $2) to (20 units, $2), while point *b* would shift rightward from location (40 units, $1) to (50 units, $1). After making these shifts, apply the midpoint formula to calculate the demand elasticities for the shifted points. Are they larger or smaller than the elasticities you calculated in Problem 1 for the original points? In terms of the midpoint formula, what explains the change in elasticities? **LO1**
3. Suppose that the total revenue received by a company selling basketballs is $600 when the price is set at $30 per basketball and $600 when the price is set at $20 per basketball. Without using the midpoint formula, can you tell whether demand is elastic, inelastic, or unit-elastic over this price range? **LO2**
4. Danny "Dimes" Donahue is a neighborhood's 9-year old entrepreneur. His most recent venture is selling homemade brownies that he bakes himself. At a price of $1.50 each, he sells 100. At a price of $1.00 each, he sells 300. Is demand elastic or inelastic over this price range? *If* demand had the same elasticity for a price decline from $1.00 to $0.50 as it does for the decline from $1.50 to $1.00, would cutting the price from $1.00 to $0.50 increase or decrease Danny's total revenue? **LO2**
5. What is the formula for measuring the price elasticity of supply? Suppose the price of apples goes up from $20 to $22 a box. In direct response, Goldsboro Farms supplies 1200 boxes of apples instead of 1000 boxes. Compute the coefficient of price elasticity (midpoints approach) for Goldsboro's supply. Is its supply elastic, or is it inelastic? **LO3**
6. **ADVANCED ANALYSIS** Currently, at a price of $1 each, 100 popsicles are sold per day in the perpetually hot town of Rostin. Consider the elasticity of supply. In the short run, a price increase from $1 to $2 is unit-elastic ($E_s = 1.0$). So how many popsicles will be sold each day in the short run if the price rises to $2 each? In the long run, a price increase from $1 to $2 has an elasticity of supply of 1.50. So how many popsicles will be sold per day in the long run if the price rises to $2 each? (Hint: Apply the midpoints approach to the elasticity of supply.) **LO3**
7. Lorena likes to play golf. The number of times per year that she plays depends on both the price of playing a round of golf as well as Lorena's income and the cost of other types of entertainment—in particular, how much it costs to go see a movie instead of playing golf. The three demand schedules in the table below show how many rounds of golf per year Lorena will demand at each price under three different scenarios. In scenario D_1, Lorena's income is $50,000 per year and movies cost $9 each. In scenario D_2, Lorena's income is also $50,000 per year, but the price of seeing a movie rises to $11. And in scenario D_3, Lorena's income goes up to $70,000 per year, while movies cost $11. **LO4**

	Quantity Demanded		
Price	D_1	D_2	D_3
$50	15	10	15
35	25	15	30
20	40	20	50

   a. Using the data under D_1 and D_2, calculate the cross elasticity of Lorena's demand for golf at all three prices. (To do this, apply the midpoints approach to the cross elasticity of demand.) Is the cross elasticity the same at all three prices? Are movies and golf substitute goods, complementary goods, or independent goods?
   b. Using the data under D_2 and D_3, calculate the income elasticity of Lorena's demand for golf at all three prices. (To do this, apply the midpoints approach to the income elasticity of demand.) Is the income elasticity the same at all three prices? Is golf an inferior good?

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