

SOLUTIONS TO TEXT PROBLEMS:

Quick Quizzes

1. The price elasticity of demand is a measure of how much the quantity demanded of a good responds to a change in the price of that good, computed as the percentage change in quantity demanded divided by the percentage change in price.

The relationship between total revenue and the price elasticity of demand is: (1) when demand is inelastic (a price elasticity less than 1), a price increase raises total revenue, and a price decrease reduces total revenue; (2) when demand is elastic (a price elasticity greater than 1), a price increase reduces total revenue, and a price decrease raises total revenue; and (3) when demand is unit elastic (a price elasticity equal to 1), a change in price does not affect total revenue.

2. The price elasticity of supply is a measure of how much the quantity supplied of a good responds to a change in the price of that good, computed as the percentage change in quantity supplied divided by the percentage change in price.

The price elasticity of supply might be different in the long run than in the short run because over short periods of time, firms cannot easily change the size of their factories to make more or less of a good. Thus, in the short run, the quantity supplied is not very responsive to the price. However, over longer periods, firms can build new factories, expand existing factories, or close old ones, or they can enter or exit a market. So, in the long run, the quantity supplied can respond substantially to the price.

3. A drought that destroys half of all farm crops could be good for farmers (at least those unaffected by the drought) if the demand for the crops is inelastic. The shift to the left of the supply curve leads to a price increase that raises total revenue because the price elasticity is less than one.

Even though a drought could be good for farmers, they would not destroy their crops in the absence of a drought because no one farmer would have an incentive to destroy his crops, since he takes the market price as given. Only if all farmers destroyed their crops together, for example through a government program, would this plan work to make farmers better off.

Questions for Review

1. The price elasticity of demand measures how much the quantity demanded responds to a change in price. The income elasticity of demand measures how much the quantity demanded responds to changes in consumer income.
2. The determinants of the price elasticity of demand include how available close substitutes are, whether the good is a necessity or a luxury, how broadly defined the market is, and the time horizon. Luxury goods have greater price elasticities than necessities, goods with close substitutes have greater elasticities, goods in more narrowly defined markets have greater elasticities, and the elasticity of demand is higher the longer the time horizon.
3. An elasticity greater than one means that demand is elastic. When the elasticity is greater than one, the percentage change in quantity demanded exceeds the percentage change in price. When the elasticity equals zero, demand is perfectly inelastic. There is no change in quantity demanded when there is a change in price.

4. Figure 1 presents a supply-and-demand diagram, showing equilibrium price, equilibrium quantity, and the total revenue received by producers. Total revenue equals the equilibrium price times the equilibrium quantity, which is the area of the rectangle shown in the figure.

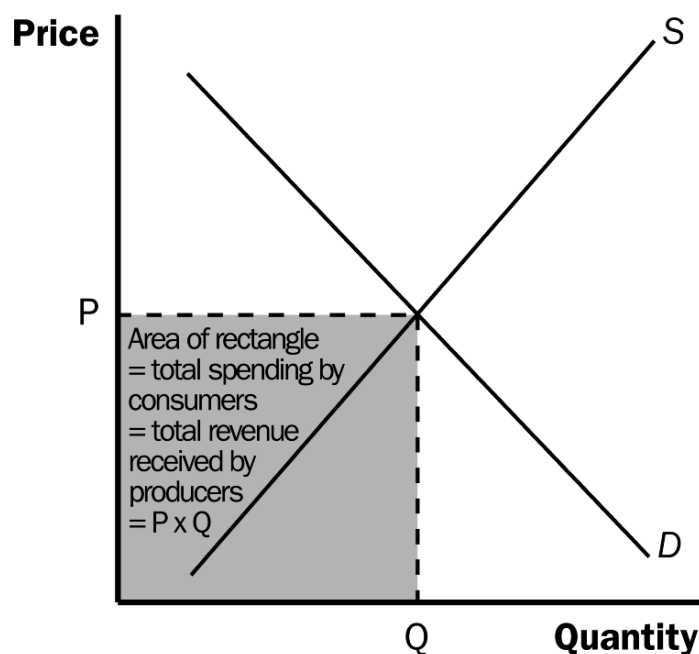


Figure 1

5. If demand is elastic, an increase in price reduces total revenue. With elastic demand, the quantity demanded falls by a greater percentage than the percentage increase in price. As a result, total revenue declines.
6. A good with an income elasticity less than zero is called an inferior good because as income rises, the quantity demanded declines.
7. The price elasticity of supply is calculated as the percentage change in quantity supplied divided by the percentage change in price. It measures how much the quantity supplied responds to changes in the price.
8. The price elasticity of supply of Picasso paintings is zero, since no matter how high price rises, no more can ever be produced.
9. The price elasticity of supply is usually larger in the long run than it is in the short run. Over short periods of time, firms cannot easily change the size of their factories to make more or less of a good, so the quantity supplied is not very responsive to price. Over longer periods, firms can build new factories or close old ones, so the quantity supplied is more responsive to price.
10. OPEC was unable to maintain a high price through the 1980s because the elasticity of supply and demand was more elastic in the long run. When the price of oil rose, producers of oil outside of OPEC increased oil exploration and built new extraction capacity. Consumers responded with greater conservation efforts. As a result, supply increased and demand fell, leading to a lower

price for oil in the long run.

Problems and Applications

1.
 - a. Mystery novels have more elastic demand than required textbooks, because mystery novels have close substitutes and are a luxury good, while required textbooks are a necessity with no close substitutes. If the price of mystery novels were to rise, readers could substitute other types of novels, or buy fewer novels altogether. But if the price of required textbooks were to rise, students would have little choice but to pay the higher price. Thus the quantity demanded of required textbooks is less responsive to price than the quantity demanded of mystery novels.
 - b. Beethoven recordings have more elastic demand than classical music recordings in general. Beethoven recordings are a narrower market than classical music recordings, so it's easy to find close substitutes for them. If the price of Beethoven recordings were to rise, people could substitute other classical recordings, like Mozart. But if the price of all classical recordings were to rise, substitution would be more difficult (a transition from classical music to rap is unlikely!). Thus the quantity demanded of classical recordings is less responsive to price than the quantity demanded of Beethoven recordings.
 - c. Heating oil during the next five years has more elastic demand than heating oil during the next six months. Goods have a more elastic demand over longer time horizons. If the price of heating oil were to rise temporarily, consumers couldn't switch to other sources of fuel without great expense. But if the price of heating oil were to be high for a long time, people would gradually switch to gas or electric heat. As a result, the quantity demanded of heating oil during the next six months is less responsive to price than the quantity demanded of heating oil during the next five years.
 - d. Root beer has more elastic demand than water. Root beer is a luxury with close substitutes, while water is a necessity with no close substitutes. If the price of water were to rise, consumers have little choice but to pay the higher price. But if the price of root beer were to rise, consumers could easily switch to other sodas. So the quantity demanded of root beer is more responsive to price than the quantity demanded of water.
2.
 - a. For business travelers, the price elasticity of demand when the price of tickets rises from \$200 to \$250 is $[(2,000 - 1,900)/1,950]/[(250 - 200)/225] = 0.05/0.22 = 0.23$. For vacationers, the price elasticity of demand when the price of tickets rises from \$200 to \$250 is $[(800 - 600)/700] / [(250 - 200)/225] = 0.29/0.22 = 1.32$.
 - b. The price elasticity of demand for vacationers is higher than the elasticity for business travelers because vacationers can choose more easily a different mode of transportation (like driving or taking the train). Business travelers are less likely to do so since time is more important to them and their schedules are less adaptable.
3.
 - a. If your income is \$10,000, your price elasticity of demand as the price of compact discs rises from \$8 to \$10 is $[(40 - 32)/36]/[(10 - 8)/9] = 0.22/0.22 = 1$. If your income is \$12,000, the elasticity is $[(50 - 45)/47.5]/[(10 - 8)/9] = 0.11/0.22 = 0.5$.
 - b. If the price is \$12, your income elasticity of demand as your income increases from \$10,000 to \$12,000 is $[(30 - 24)/27] / [(12,000 - 10,000)/11,000] = 0.22/0.18 = 1.22$. If the price is \$16, your income elasticity of demand as your income increases from

\$10,000 to \$12,000 is $[(12 - 8)/10] / [(12,000 - 10,000)/11,000] = 0.40/0.18 = 2.2$.

4.
 - a. If Emily always spends one-third of her income on clothing, then her income elasticity of demand is one, since maintaining her clothing expenditures as a constant fraction of her income means the percentage change in her quantity of clothing must equal her percentage change in income. For example, suppose the price of clothing is \$30, her income is \$9,000, and she purchases 100 clothing items. If her income rose 10 percent to \$9,900, she'd spend a total of \$3,300 on clothing, which is 110 clothing items, a 10 percent increase.
 - b. Emily's price elasticity of clothing demand is also one, since every percentage point increase in the price of clothing would lead her to reduce her quantity purchased by the same percentage. Again, suppose the price of clothing is \$30, her income is \$9,000, and she purchases 100 clothing items. If the price of clothing rose 1 percent to \$30.30, she would purchase 99 clothing items, a 1 percent reduction. [Note: This part of the problem can be confusing to students if they have an example with a larger percentage change and they use the point elasticity. Only for a small percentage change will the answer work with an elasticity of one. Alternatively, they can get the second part if they use the midpoint method for any size change.]
 - c. Since Emily spends a smaller proportion of her income on clothing, then for any given price, her quantity demanded will be lower. Thus her demand curve has shifted to the left. But because she'll again spend a constant fraction of her income on clothing, her income and price elasticities of demand remain one.
5.
 - a. With a 4.3 percent decline in quantity following a 20 percent increase in price, the price elasticity of demand is only $4.3/20 = 0.215$, which is fairly inelastic.
 - b. With inelastic demand, the Transit Authority's revenue rises when the fare rises.
 - c. The elasticity estimate might be unreliable because it is only the first month after the fare increase. As time goes by, people may switch to other means of transportation in response to the price increase. So the elasticity may be larger in the long run than it is in the short run.
6. Tom's price elasticity of demand is zero, since he wants the same quantity regardless of the price. Jerry's price elasticity of demand is one, since he spends the same amount on gas, no matter what the price, which means his percentage change in quantity is equal to the percentage change in price.
7. To explain the fact that spending on restaurant meals declines more during economic downturns than does spending on food to be eaten at home, economists look at the income elasticity of demand. In economic downturns, people have lower income. To explain the fact, the income elasticity of restaurant meals must be larger than the income elasticity of spending on food to be eaten at home.
8.
 - a. With a price elasticity of demand of 0.4, reducing the quantity demanded of cigarettes by 20 percent requires a 50 percent increase in price, since $20/50 = 0.4$. With the price of

cigarettes currently \$2, this would require an increase in the price to \$3.33 a pack using the midpoint method (note that $(\$3.33 - \$2)/\$2.67 = .50$).

- b. The policy will have a larger effect five years from now than it does one year from now. The elasticity is larger in the long run, since it may take some time for people to reduce their cigarette usage. The habit of smoking is hard to break in the short run.
 - c. Since teenagers don't have as much income as adults, they are likely to have a higher price elasticity of demand. Also, adults are more likely to be addicted to cigarettes, making it more difficult to reduce their quantity demanded in response to a higher price.
9. You'd expect the price elasticity of demand to be higher in the market for vanilla ice cream than for all ice cream because vanilla ice cream is a narrower category and other flavors of ice cream are close substitutes for vanilla.
- You'd expect the price elasticity of supply to be larger for vanilla ice cream than for all ice cream. A producer of vanilla ice cream could easily adjust the quantity of vanilla ice cream and produce other types of ice cream. But a producer of ice cream would have a more difficult time adjusting the overall quantity of ice cream.
10. a. As Figure 2 shows, in both markets, the increase in supply reduces the equilibrium price and increases the equilibrium quantity.

- b. In the market for pharmaceutical drugs, with inelastic demand, the increase in supply leads to a relatively large decline in the price and not much of an increase in quantity.

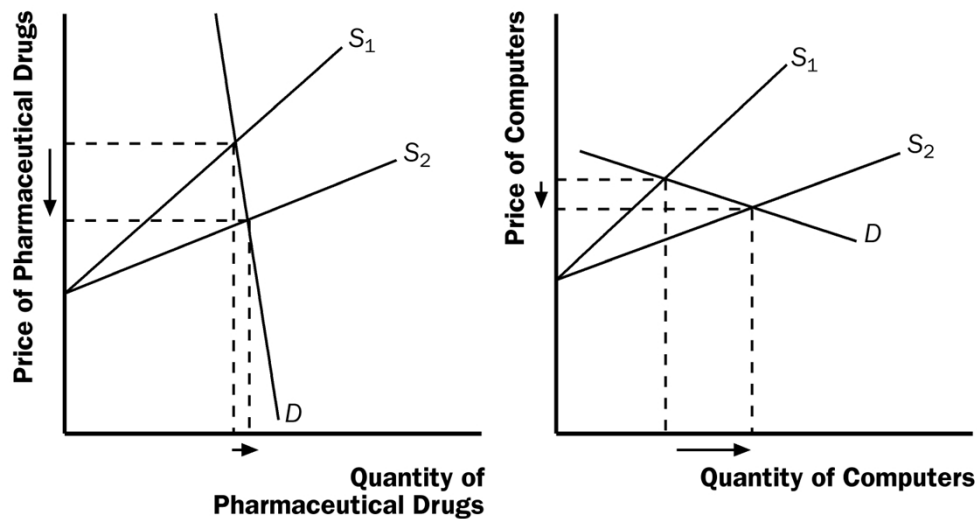


Figure 2

- c. In the market for computers, with elastic demand, the increase in supply leads to a relatively large increase in quantity and not much of a decline in price.
- d. In the market for pharmaceutical drugs, since demand is inelastic, the percentage increase in quantity will be less than the percentage decrease in price, so total consumer spending will decline. In contrast, since demand is elastic in the market for computers, the percentage increase in quantity will be greater than the percentage decrease in price, so total consumer spending will increase.
11. a. As Figure 3 shows, in both markets the increase in demand increases both the equilibrium price and the equilibrium quantity.
- b. In the market for beachfront resorts, with inelastic supply, the increase in demand leads to a relatively large increase in the price and not much of an increase in quantity.
- c. In the market for automobiles, with elastic supply, the increase in demand leads to a relatively large increase in quantity and not much of an increase in price.
- d. In both markets, total consumer spending rises, since both equilibrium price and equilibrium quantity rise.

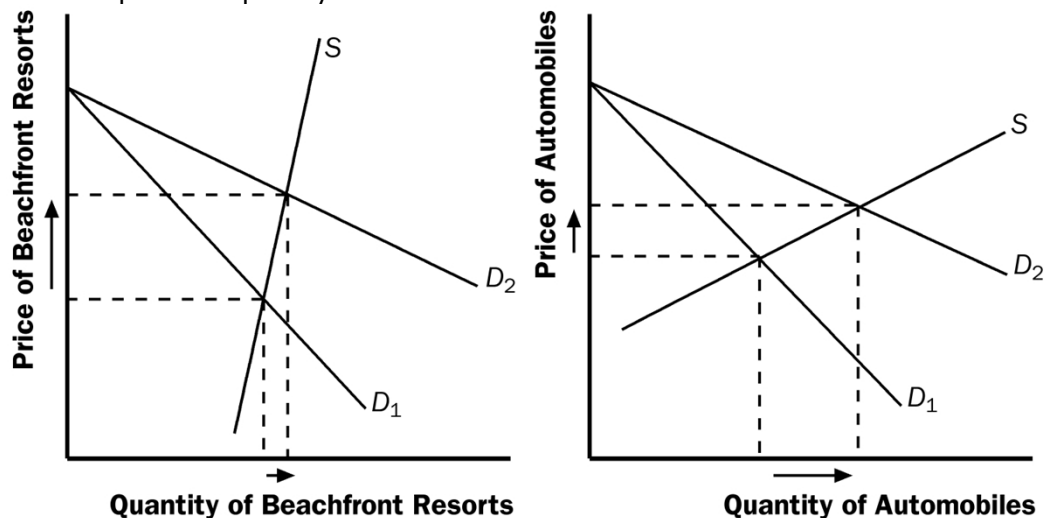


Figure 3

12. a. Farmers whose crops weren't destroyed benefited because the destruction of some of the crops reduced the supply, causing the equilibrium price to rise.
- b. To tell whether farmers as a group were hurt or helped by the floods, you'd need to know the price elasticity of demand. It could be that the additional income earned by farmers whose crops weren't destroyed rose more because of the higher prices than farmers whose crops were destroyed, if demand is inelastic.
13. A worldwide drought could increase the total revenue of farmers if the price elasticity of demand for grain is inelastic. The drought reduces the supply of grain, but if demand is inelastic, the reduction of supply causes a large increase in price. Total farm revenue would rise as a result. If there's only a drought in Kansas, Kansas' production isn't a large enough proportion of the total farm product to have much impact on the price. As a result, price does not change (or changes by only a slight amount), while the output of Kansas farmers declines, thus reducing

their income.

14. When productivity increases for all farmland at a point in time, the increased productivity leads to a rise in farmland prices, since more output can be produced on a given amount of land. But prior to the technological improvements, the productivity of farmland depended mainly on the prevailing weather conditions. There was little opportunity to substitute land with worse weather conditions for land with better weather conditions. As technology improved over time, it became much easier to substitute one type of land for another. So the price elasticity of supply for farmland increased over time, since now land with bad weather is a better substitute for land with good weather. The increased supply of land reduced farmland prices. As a result, productivity and farmland prices are negatively related over time.