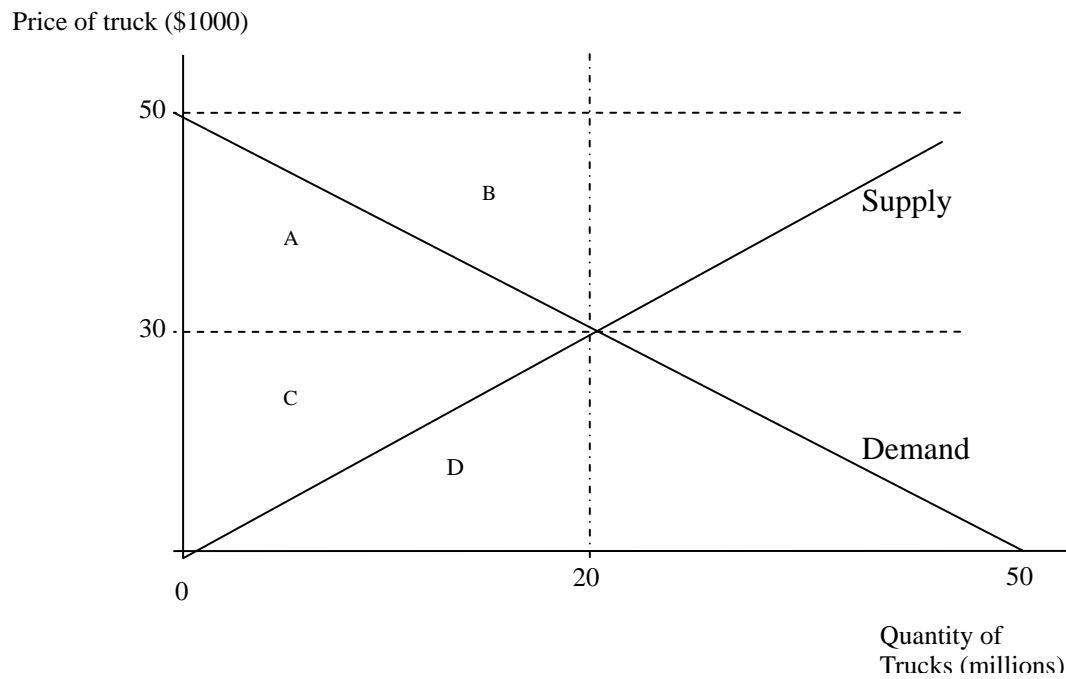


Homework #2 Answers

Use the following graph of the annual U.S. demand and supply for pickup trucks to answer the next three questions.



1. What is the equilibrium price and quantity?

$$P^* = 30, Q^* = 20$$

2. What is the price elasticity of demand at the competitive equilibrium?
- a. $3/2$
 - b. 1
 - c. $3/5$
 - d. $2/3$
 - e. None of above

The demand equation is given by

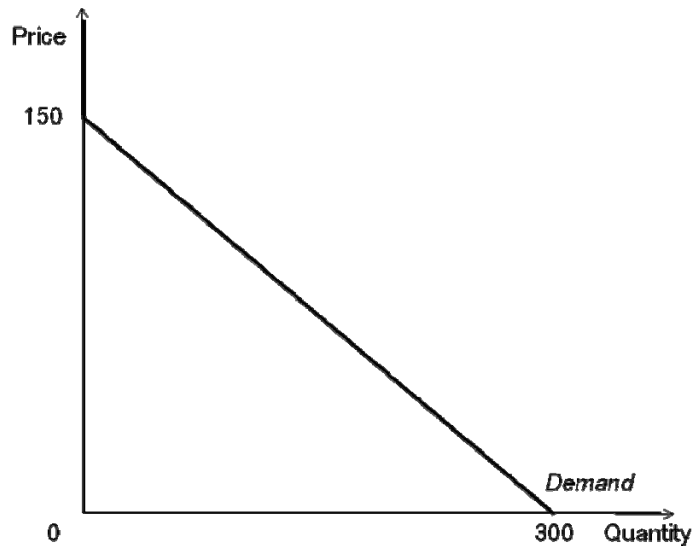
$$P = 50 - Q_d \Rightarrow Q_d = 50 - P$$

Thus, the price elasticity of demand is

$$\varepsilon = \left| \frac{\frac{\Delta Q_d}{Q_d}}{\frac{\Delta P}{P}} \right| = \frac{1}{\left(\frac{20}{30} \right)} = \frac{3}{2}$$

3. Suppose the tires used on pickup trucks are found to be defective, causing demand for pickup trucks to fall. Which of the following statements is true?
- a. The equilibrium price falls and the equilibrium quantity increases.
 - b. Both the equilibrium price and quantity increase.
 - c. ***Both the equilibrium price and quantity fall.***
 - d. The equilibrium price increases and the equilibrium quantity falls.
 - e. The equilibrium price and quantity stays the same.

The graph below shows the demand for jeans.



Answer following questions using the graph above.

4. What is the equation of the demand curve?

The line has a vertical intercept of 150 and a slope of 0.5, thus the equation for the inverse demand curve is

$$P = 150 - 0.5 \cdot Q_d$$

which implies

$$Q_d = 300 - 2P$$

5. Suppose the supply curve is given by $Q_s = 150 + P$. Draw the supply curve on the graph.

To draw the supply curve simply put it in slope intercept form for price on the vertical axis and quantity on the horizontal axis.

$$P = Q_s - 150$$

The supply curve has a vertical intercept of -150 and a slope of 1.

6. The market equilibrium quantity and price are:
- $P=100, Q=250$
 - $P=50, Q=200$**
 - $P=200, Q=50$
 - $P=150, Q=300$
 - $P=50, Q=150$

Setting quantity supplied equal to quantity demanded

$$Q_s = 150 + P = Q_d = 300 - 2P \Rightarrow 3P = 150$$

$$\Rightarrow P^* = 50, Q^* = 200$$

7. Currently, the market for the book *Anna Karenina* is in equilibrium. What would happen to the equilibrium price and quantity if it's used for the Oprah Book Club and printing costs for books are lowered by the invention of a synthetic paper product?
- Both equilibrium price and quantity would increase.
 - Equilibrium price falls, but quantity increases.
 - Equilibrium price increases and quantity falls.
 - Equilibrium quantity increases, but equilibrium price could increase or decrease. (both the supply and demand curve shift out)***
 - There is no change in either price or quantity.

Suppose there is a life-saving drug, with demand for the drug described by the equation $Q_D = 1$ and an upward sloping supply curve. Now there is a positive technology change in production of the drug so at any given price, the quantity supplied increases.

8. Which of the following may happen after the positive technology change in production of the drug?
- The equilibrium quantity increases, but the equilibrium price decreases
 - There is an increase in both equilibrium price and quantity
 - Only equilibrium price decreases***
 - The equilibrium price decreases but equilibrium quantity can either increase or decrease
 - There is a decrease in both equilibrium price and quantity

Consider the market for soybeans. The demand curve is given by the equation $p = -\left(\frac{1}{10}\right)Q_d + 700$ and the supply curve is given by $Q_s = 2P - 200$.

9. Draw the supply and demand curves for soybeans and calculate the equilibrium price and quantity in the market for soybeans.

The demand curve has a vertical (p) intercept of 700 and a slope of $-\frac{1}{10}$

To graph the supply curve we need to put it in slope intercept form for price on the vertical axis

$$Q_s = 2p - 200 \Rightarrow P = 100 + \frac{1}{2}Q_s$$

Thus the supply curve has a vertical intercept of 100 and a slope of 0.5.

We can find the equilibrium by setting the quantity demanded equal to quantity supplied. Note

$$P = -\left(\frac{1}{10}\right)Q_d + 700 \Rightarrow Q_d = 7000 - 10 \cdot P$$

So setting quantity demanded to quantity supplied

$$Q_d = 7000 - 10 \cdot P = Q_s = 2P - 200 \Rightarrow 12 \cdot P = 7200 \\ \Rightarrow P^* = 600, Q^* = 1000$$

10. Suppose soybeans are selling for \$500. Is there a shortage or surplus in the market? If so, what does the surplus or shortage equal?

$$Q_d(500) = 7000 - 10(500) = 2000 \\ Q_s(500) = 2(500) - 200 = 800$$

There would be a shortage of 1200 units.

11. Suppose soybeans are selling for \$700. Is there a shortage or surplus in the market? If so, what does the surplus or shortage equal?

$$Q_d(700) = 7000 - 10(700) = 0 \\ Q_s(700) = 2(700) - 200 = 1200$$

There would be a surplus of 1200 units.

12. If the demand equation is $P = 120 - 2Q$, what is the price elasticity of demand when quantity is 40?

First we need to solve for Q_d in terms of P

$$P = 120 - 2Q_d \Rightarrow Q_d = 60 - 0.5 \cdot P$$

$$\epsilon = \frac{\left| \frac{\left(\frac{\Delta Q_d}{Q_d} \right)}{\left(\frac{\Delta P}{P} \right)} \right|}{\left(\frac{Q_d}{P} \right)} = \frac{0.5}{\left(\frac{40}{40} \right)} = 0.5$$

40 is the price corresponding with a quantity demanded of 40

Amy's demand for cheesecake is $Q_d = 90 - 4P$.

13. At price $P = 20$, what is the price elasticity of demand? Hint: Use the point elasticity of demand formula to calculate this elasticity.

$$\varepsilon = \frac{\left| \left(\frac{\Delta Q_d}{\Delta P} \right) \right|}{\left(\frac{Q_d}{P} \right)} = \frac{4}{\left(\frac{10}{20} \right)} = 8$$

10 is the quantity demand corresponding with a price of 20

14. Calculate the price elasticity as the price moves from $P_0 = 20$ to $P_1 = 15$ by using the mid-point price elasticity formula (hint: this is the same formula as the arc elasticity formula).

$$\varepsilon = \frac{\left| \left(\frac{Q_d^1 - Q_d^0}{Q} \right) \right|}{\left(\frac{P^1 - P^0}{P} \right)} = \frac{\left| \left(\frac{30 - 10}{20} \right) \right|}{\left(\frac{15 - 20}{17.5} \right)} = \frac{1}{\left(\frac{5}{17.5} \right)} = \frac{17.5}{5} = 3.5$$

15. Amy got a raise at work, and her income increases by 25%. As a result, her demand for cheesecakes increases by 15%. What is Amy's income elasticity of demand for cheesecakes? What does this income elasticity tell us about Amy's valuation of cheesecakes (are cheesecakes normal or inferior goods)?

$$\varepsilon_{D,Y} = \frac{\text{the percentage change in demand}}{\text{the percentage change in income}} = \frac{15}{25} = \frac{3}{5} = 0.6$$