Chapter 2

Supply and Demand Analysis

Solutions to Problems

2.1

2.2

b)
which implies that *P* = 5.

2.3

a)

b)

Plugging $P = 50$ back into either the supply or demand equation yields $Q = 500$.

2.4.

P	0.10	0.45	0.50	0.55	2.50
Q^d	290	255	250	245	50
$\varepsilon_{Q,P}$	–0.035	–0.176	–0.2	–0.225	–5

For all prices below $1.50, the demand is inelastic, while for all prices above $1.50, the demand is elastic.

2.5.

When the elasticity is -1, *Q* = 300 and *P* = $3.

Thus demand is unitary elastic at a price *P* = $3.

2.6.

To find elasticity of demand at any point on the demand curve, we use formula

$$E_{Q,P} = \frac{\Delta Q}{\Delta P}\frac{P}{Q} = -6\frac{P}{Q}$$

2.7 a) Since the price is being bid up above the official price, quantity demanded must exceed quantity supplied at the official price. This is a situation of excess demand and the official price must be below the equilibrium price.

b) Lowering the official price would increase the amount of excess demand, but would have no effect on the demand or supply curves. Thus the equilibrium price would remain unchanged.

2.8 This could occur as a result of the demand curve shifting to the right, increasing both equilibrium price and quantity. This would not contradict what was learned regarding downward sloping demand curves.

2.9 The law of demand states that, holding other factors fixed, there is an inverse relationship between price and quantity demanded, i.e. that an increase in price decreases quantity and vice versa. If a good has a positive price elasticity of demand, it must be that an increase in the price of that good leads to an increase in the quantity demanded. Therefore, such a good violates the law of demand.

2.10

a)

An increase in rainfall will increase supply, lowering the equilibrium price and increasing the equilibrium quantity.

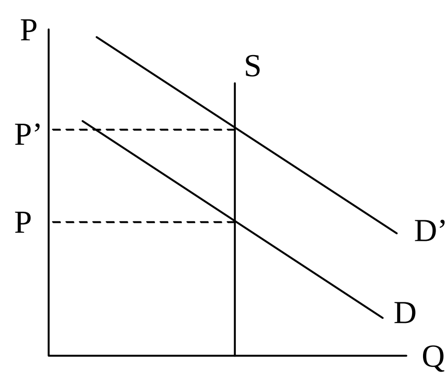
b)

A decrease in disposable income will reduce demand, shifting the demand schedule left, reducing both the equilibrium price and quantity.

2.11

a) A perfectly inelastic demand curve will be vertical.

b) The renewed interest will shift demand to the right, raising the equilibrium price. Since supply is perfectly inelastic (and therefore vertical) there will be no change in the quantity supplied; the quantity is fixed.



2.12

$$Q = 350 - 7P$$

a) $7P = 350 - Q$

$$P = 50 - \tfrac{1}{7}Q$$

b) $P = 50$.

c) negative infinity.

2.13 400 or 600.

2.14 Her demand for ice cream is quite elastic $(\varepsilon_{Q,P} < -1)$.

2.15

a) More elastic in the long run.

b) More elastic in the short run.

c) More elastic in the long run.

2.16

a) $P = 12$. Substituting this value back, $Q = 46$.

b) Elasticity of Demand = –2(12/46), or –0.52. Elasticity of Supply = 5(12/46) = 1.30.

c) $\varepsilon_{golf,titanium} = -2(\frac{10}{46}) = -0.43$. The negative sign indicates that titanium and golf balls are complements, i.e., when the price of titanium goes up the demand for golf balls decreases.

2.18

a) Since the two goods are rather close substitutes for each other, you would expect that the demand for Tylenol would go up if the price of Advil increases and vice versa. Therefore, the cross price elasticity will be positive.

b) Similar to part (a). Although VCRs and DVD players are not very close substitutes, if the price of VCRs were to go up substantially, potential buyers would probably decide to pay a little bit more and get the higher-end DVD player. Similarly if the latter becomes expensive, some consumers will not be able to afford it and will switch to the VCR instead. The elasticity will be positive.

c) Since the two usually go together, a sharp increase in the price of one will lead to a decline in the demand for the other, and the cross-price elasticity will be negative.

2.19

a) positive.

b) positive.

c) negative.

d) negative.

e) negative.

2.20

a)
$$Q_U^d = 10000 - 100(300) + 99(300)$$
$$Q_U^d = 9700$$

Using $P_U = 300$ and $Q_U^d = 9700$ gives

$$\varepsilon_{Q,P} = -100\left(\frac{300}{9700}\right) = -3.09$$

b) Market demand is given by $Q^d = Q_U^d + Q_A^d$. Assuming the airlines charge the same price we have

$$Q^d = 10000 - 100P_U + 99P_A + 10000 - 100P_A + 99P_U$$
$$Q^d = 20000 - 100P + 99P - 100P + 99P$$
$$Q^d = 20000 - 2P$$

When $P = 300$, $Q^d = 19400$. This implies an elasticity equal to

$$\varepsilon_{Q,P} = -2\left(\frac{300}{19400}\right) = -.0309$$

2.21 We know that along a linear demand curve

$$\varepsilon_{Q,P} = -b\left(\frac{P}{Q}\right)$$

Using the given information this implies

$$-.5 = -b\left(\frac{.05}{10,000,000}\right)$$
$$b = 100,000,000$$

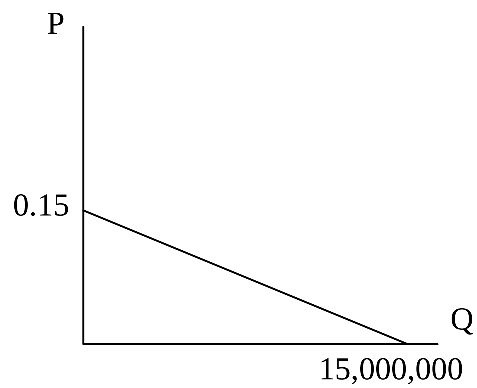
Plugging this result into a demand equation using the known price and quantity then implies

$$Q^d = A - bP$$
$$10,000,000 = A - 100,000,000(.05)$$
$$A = 15,000,000$$

So a demand equation that fits this information is given by

$$Q^d = 15,000,000 - 100,000,000P$$

Graphically, the demand curve looks like



2.22

a) In case of the linear demand $Q = A - bP$, we know that $\varepsilon_{Q,P} = -b\frac{P}{Q} = -1$

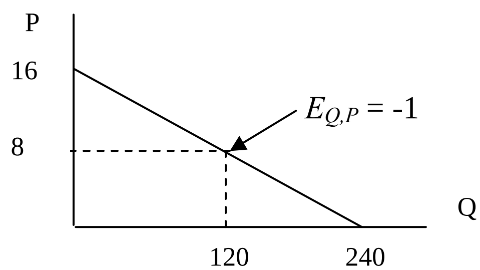
Using the values of P and Q given in the problem we have

$$-1 = -b\frac{8}{120} \quad \Rightarrow \quad b = \frac{120}{8} = 15.$$

Now we can solve for the second parameter of the linear demand curve

$$120 = a - 15(8) \quad \Rightarrow \quad a = 240.$$

Hence the linear demand curve is given by equation $Q^d = 240 - 15P$.



b) There exist several linear demand curves for which the demand is equal to 120 at price of $8. Information about elasticity of demand lets us determine exactly one of those. More formally, we need second equation to solve for both parameters of the linear demand curve.

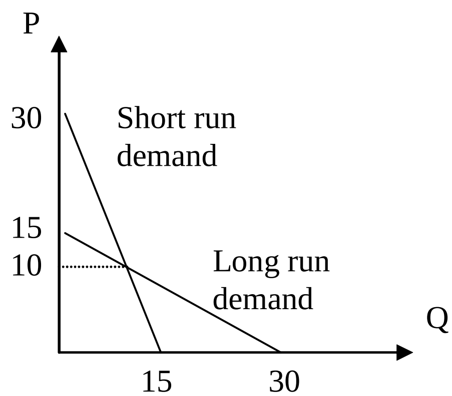
2.23

a) Butter has some reasonably close substitutes such as margarine or cheese, while eggs have no immediate substitutes. Therefore we would expect the demand for butter to be more elastic.

b) Vacation trips are sensitive to price because leisure travelers can be relatively flexible about when to fly. Your congressman, however, has fixed dates on which to be in Washington and would be prepared to pay more to ensure that he flies on the day of his choosing. Therefore, demand for vacation trips is likely to be more elastic (i.e. the price elasticity will be more negative) than the demand for trips by your congressman.

c) As discussed in the chapter, market level elasticities tend to be lower (less negative) than the elasticity of a particular brand. Thus, expect the demand for Tropicana to be more elastic than the demand for generic orange juice.

2.24 First, consider each demand curve in its "inverse" form: long run demand is $P = 15 - 0.5Q$, and short run demand is $P = 30 - 2Q$. Thus, the slope of the long run demand is –0.5, which is closer to zero than that of the short run demand, –2. Thus, long run demand is flatter. Second, consider the graph below:



Again, long run demand is flatter and thus more sensitive to changes in price. Consider, for instance a price of $10. Quantity demanded is equal in both the long and short runs at $P = 10$. However, consider increasing the price to, say, $15. Although this will reduce quantity demanded in the short run by a little, it would reduce quantity demanded all the way to zero in the long run.

2.25 The scare in 1999 would shift demand to the left, identifying a second point on the supply curve. The information implies that price fell $0.50 while quantity fell 1.5 million. This implies

$$b = \frac{-.5}{-.15} = \frac{1}{3}$$

Using a linear supply curve we then have

$$P = a + \frac{1}{3}Q^s$$
$$5 = a + \frac{1}{3}(4)$$
$$a = \frac{11}{3}$$

Finally, plugging these values for a and b into the supply equation results in

$$P = \frac{11}{3} + \frac{1}{3}Q^s$$
$$3P = 11 + Q^s$$
$$Q^s = -11 + 3P$$

The floods in 2000 will reduce supply. The shift in supply will identify a second point along the demand curve. Because the scare of 1999 is over, assume that demand has returned to its 1998 state. The change in price and quantity in 2000 imply that price increased $3.00 and that quantity fell 0.5 million.

Performing the same exercise as above we have

$$-b = \frac{3}{-0.5} = -6$$

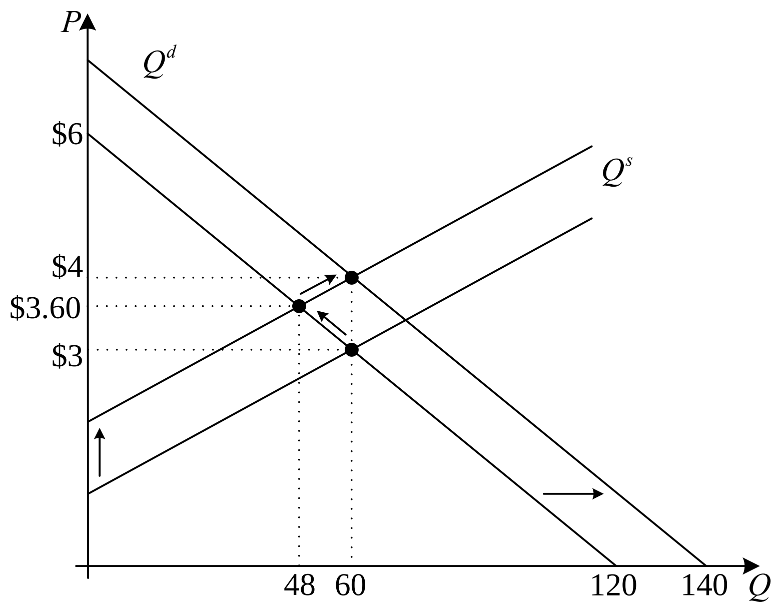
Using the 1998 price and quantity information along with this result yields

$$P = a - bQ^d$$
$$5 = a - 6(4)$$
$$a = 29$$

Finally, plugging these values for a and b into a linear demand curve results in

$$P = 29 - 6Q^d$$
$$6Q^d = 29 - P$$
$$Q^d = \frac{29}{6} - \frac{1}{6}P$$

2.26 The equilibrium price in January is equal to P = 3 and equilibrium quantity is equal to Q = 60. We find equilibrium price by solving $Q^s = Q^d$, which is $30 \cdot P - 30 = 120 - 20 \cdot P$. When we have equilibrium price we can substitute it to either the demand function or supply function, since they have to give the same quantity at that price, and obtain equilibrium quantity equal to Q = 60. After the supply decreases in February, new equilibrium price is per mile is equal to P = $3.60, while the demanded quantity is equal to Q = 48. When the demand goes up in March, the quantity in equilibrium is the same as in January but price is even higher and equal to P = $4. All those changes are illustrated on the graph below.


P
Q^d
$6
Q^s
$4
$3.60
$3
48
60
120
140
Q

