Homework #4-Math 211

More Problems for Section 1.4

5. Suppose that $q = f(p)$ is the demand curve for a product, where p is the selling price in dollars and q is the quantity sold at that price.

(a) What does the statement $f(12) = 60$ tell you about demand for this product?
(b) Do you expect this function to be increasing or decreasing? Why?

7. A demand curve is given by $75p + 50q = 300$, where p is the price of the product, in dollars, and q is the quantity demanded at that price. Find p- and q-intercepts and interpret them in terms of consumer demand.

23. Figure 1.56 shows supply and demand for a product.

(a) What is the equilibrium price for this product? At this price, what quantity is produced?
(b) Choose a price above the equilibrium price—for example, $p = 12$. At this price, how many items are suppliers willing to produce? How many items do consumers want to buy? Use your answers to these questions to explain why, if prices are above the equilibrium price, the market tends to push prices lower (toward the equilibrium).
(c) Now choose a price below the equilibrium price—for example, $p = 8$. At this price, how many items are suppliers willing to produce? How many items do consumers want to buy? Use your answers to these questions to explain why, if prices are below the equilibrium price, the market tends to push prices higher (toward the equilibrium).

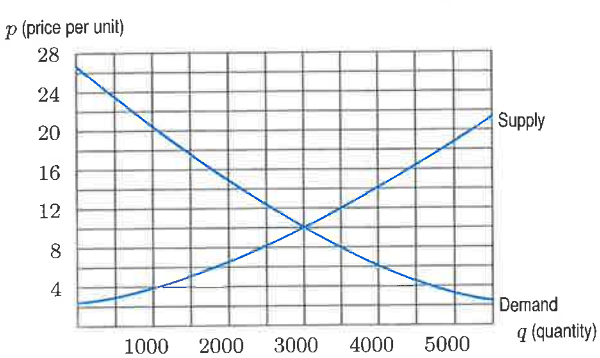


Figure 1.56

25. A company produces and sells shirts. The fixed costs are \$7000 and the variable costs are \$5 per shirt.

(a) Shirts are sold for \$12 each. Find cost and revenue as functions of the quantity of shirts, q.
(b) The company is considering changing the selling price of the shirts. Demand is $q = 2000 - 40p$, where p is price in dollars and q is the number of shirts. What quantity is sold at the current price of \$12? What profit is realized at this price?
(c) Use the demand equation to write cost and revenue as functions of the price, p. Then write profit as a function of price.
(d) Graph profit against price. Find the price that maximizes profits. What is this profit?

31. You have a budget of \$1000 for the year to cover your books and social outings. Books cost (on average) \$40 each and social outings cost (on average) \$10 each. Let b denote the number of books purchased per year and s denote the number of social outings in a year.

(a) What is the equation of your budget constraint?
(b) Graph the budget constraint. (It does not matter which variable you put on which axis.)
(c) Find the vertical and horizontal intercepts, and give a financial interpretation for each.

35. A supply curve has equation $q = 4p - 20$, where p is price in dollars. A \$2 tax is imposed on suppliers. Find the equation of the new supply curve. Sketch both curves.

38. In Example 8, the demand and supply curves are given by $q = 100 - 2p$ and $q = 3p - 50$, respectively; the equilibrium price is \$30 and the equilibrium quantity is 40 units. A sales tax of 5% is imposed on the consumer.

(a) Find the equation of the new demand and supply curves.
(b) Find the new equilibrium price and quantity.
(c) How much is paid in taxes on each unit? How much of this is paid by the consumer and how much by the producer?
(d) How much tax does the government collect?

39. Answer the questions in Problem 38, assuming that the 5% sales tax is imposed on the supplier instead of the consumer.

No solution to 38 given.
Do 39 instead.

Section 1.4

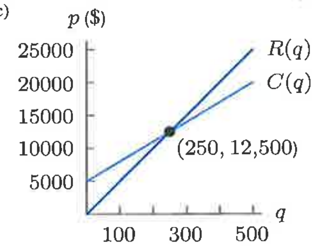
1 (a) When more than roughly 335 items are produced and sold
(b) About \$650

3 (a) \$75; \$7.50 per unit
(b) \$150

5 (a) Price \$12, sell 60
(b) Decreasing

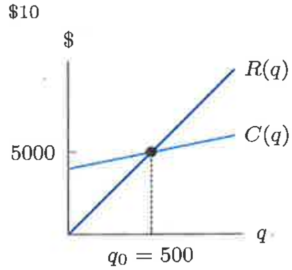
7 Vertical intercept: $p = 4$ dollars
Horizontal intercept: $q = 6$ units

9 (a) $C(q) = 5000 + 30q$
$R(q) = 50q$
(b) \$30/unit, \$50/unit
(c)



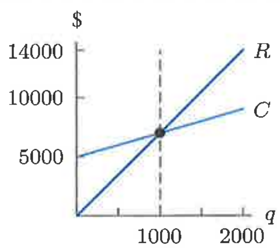
(d) 250 chairs and \$12,500

11 (a) \$4000
(b) \$2
(c) \$10
(d)



(e) 500

13 (a) When there are are more than 1000 customers
(b)

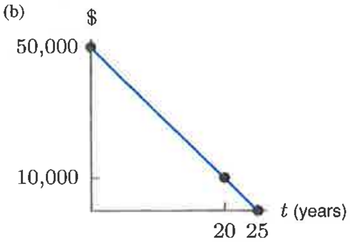


15 (a) $C(q) = 650,000 + 20q$
$R(q) = 70q$
$\pi(q) = 50q - 650,000$
(b) \$20/pair, \$70/pair, \$50/pair
(c) More than 13,000 pairs

17 (a) Between 20 and 60 units
(b) About 40 units

19 (a) $V(t) = -1500t + 15,000$
(b) $V(3) = \$10,500$

21 (a) $V(t) = -2000t + 50,000$
(b)



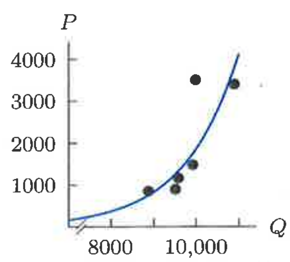
(c) (0 years, \$50,000) and (25 years, \$0)

23 (a) $p = \$10$; $q = 3000$
(b) Suppliers produce 3500 units; Consumers buy 2500
(c) Suppliers produce 2500 units; Consumers buy 3500

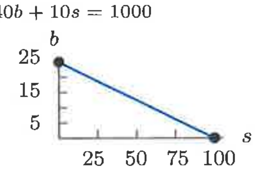
25 (a) $C = 5q + 7000$
$R = 12q$
(b) $q = 1520$, $\pi(12) = \$3640$
(c) $C = 17,000 - 200p$
$R = 2000p - 40p^2$
$\pi(p) = -40p^2 + 2200p - 17,000$
(d) At \$27.50 per shirt the profit is \$13,250

27 (a) $q = 820 - 20p$
(b) $p = 41 - 0.05q$

29

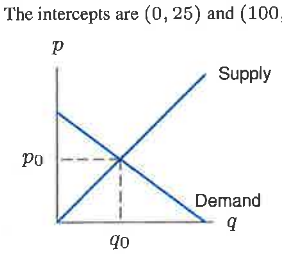


31 (a) $40b + 10s = 1000$
(b)



(c) The intercepts are $(0, 25)$ and $(100, 0)$

33 (a)



(b) Equilibrium price will increase; equilibrium quantity will decrease
(c) Equilibrium price and quantity will decrease

35 $q = 4p - 28$

37 (a) $p = 100$, $q = 500$
(b) $p = 102$, $q = 460$
(c) Consumer pays \$2
Producer pays \$4
(d) \$2760

39 (a) Demand: $q = 100 - 2p$
Supply: $q = 2.85p - 50$
(b) New equilibrium price $p \approx \$30.93$
New equilibrium quantity $q \approx 38.14$ units
(c) Consumer pays \$0.93
Producer pays \$0.62
Total \$1.55
(d) \$59.12

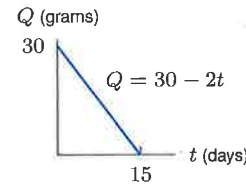
Section 1.5

1 (a) (i), 12%
(b) (ii), 1000
(c) Yes, (iv)

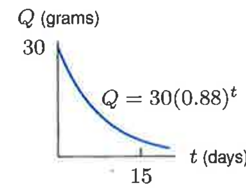
3 (a) II
(b) I
(c) III
(d) V

5 (a) $G = 310(1.03)^t$
(b) $G = 310 + 8t$

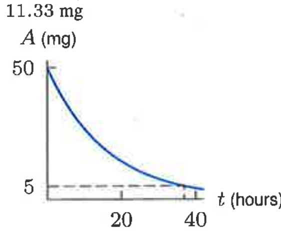
7 (a) $Q = 30 - 2t$



(b) $Q = 30(0.88)^t$



9 (a) $A = 50(0.94)^t$
(b) 11.33 mg
(c)



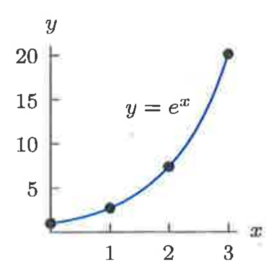
(d) About 37 hours

11 $\text{CPI} = 211(1.028)^t$

13 (a)

x	0	1	2	3
e^x	1	2.72	7.39	20.09

(b)



(c)

x	0	1	2	3
e^{-x}	1	0.37	0.14	0.05