Chapter 1 Homework Problems
Compiled by Joe Kahlig

Section 1.3

1. Entomologists have discovered that there is a linear relationship between the number of chirps of crickets of a certain species and the air temperature. When the temperature is $70^o F$, the cricket chirp at the rate of 120 times per minute, and the crickets chirp at the rate of 160 times per minute when the temperature is $80^o F$.

   (a) Find a equation that gives the chirping rate as a function of the air temperature.

   (b) Use this equation to determine the chirping rate when the temperature is $102^o F$.

   (c) Do the x and y intercepts make sense? explain.

2. The radius bone extends from the wrist to the elbow. A person whose radius bone is 24cm long is 172cm tall, while another person with a radius bone of 26cm is 175cm tall.

   (a) Write a linear equation showing how the height, y, corresponds to the length, x, of a person's radius bone.

   (b) How tall is a person whose radius bone measures 20cm?

   (c) Do the x and y intercepts of this equation make sense? explain.

3. The blue-book value of a Chevy truck was $20,000 when it was 3 years old and $12,600 when it was 8 years old. Assuming the value changes in a linear fashion, find the equation that gives the linear depreciation of the truck as a function of its age.

4. An automobile purchased for use by the manager of a firm at a price of $14,000 is to be depreciated using the straight-line method over five years. What will the book value of the automobile be at the end of five years if the automobile has a scrap value of $1,000 at the end of 10 years?

5. A new machine that costs $50,000 has a useful life of nine years and a scrap value of $500.

   (a) Using a straight-line depreciation, find the equation for the value V in terms of x where x is in years.

   (b) What is the slope and its significance?

6. Bob has a a tractor that was worth $85,000 three years after he purchased it and eight years later is was worth $36,000. Assume that the value of the tractor depreciates linearly.

   (a) Find a linear equation that gives the value of the tractor x years after it was bought.

   (b) How much did the tractor cost when it was new?

   (c) What is the rate of depreciation?

7. In 1980 a certain rare coin was worth $185 and it was worth $220 in 1994. Assume that the value of the coin increases linearly as a function of time since 1980. Find a linear equation that gives the value of the coin as a function of time.

8. Jason bought a four year old RV for $40,000. Eight years later he sold it for $15,000. Assume that the value of the RV depreciates linearly.

   (a) Find linear equation that gives the value of the RV where x is the age of the RV.

   (b) How much did the RV cost when it was new?

   (c) What is the rate of depreciation?

9. Executive Auto Rental charges a fixed daily rate and a mileage charge. One customer rents a car for one day and drives it 125 miles. His bill is $35.75. Another customer rents a car for one day and drives it 265 miles. Her bill is $51.15. Write the linear equation that gives the cost as a function of the miles driven.

Section 1.4

10. If possible, find the point of intersection of these lines.

    (a) $7x - y = 32$
    $2x + 3y = 19$

    (b) $3x - 4y = 22$
    $2x + 5y = 7$

    (c) $2x - 3y = -27$
    $5x - 7.5y = 4$

    (d) $y - 1.5x = -4$
    $x + 3y + 3 = 0$

    (e) $y - 2x = -4$
    $x + 3y + 3 = 0$

11. Find the break even point for the firm with a cost function of $C(x) = 15x + 12000$ and revenue function $R(x) = 21x$.

12. Bob's Scantron Store sells scantrons for $0.25 each. The store purchases them for $0.15 each. If the store breaks even when 6500 scantrons are sold each month,

    (a) What is the revenue function?

    (b) what is the cost function? (Assume it is linear.)

    (c) What is the profit function?

13. Dave sells widgets at his widget stand. He buys the widgets for $5 each. When he sells 30 in a month, then his profit is $290. When he sells 20 widgets in a month, then his cost for that month is $500. Find Dave's monthly cost function and revenue function.

14. Nathan operates a geography tutoring stand. His monthly rent for the stand is $45 and he has to pay A&M $0.75 for each question that he answers.

    (a) What should Nathan charge to answer each question if he wants to make a profit of $15 when answering 40 questions?

    (b) How many questions does he have to answer so that he will break even?

15. Phill sells cds at his music stand and has a monthly rent of $600. When he buys 60 cds then his cost for that month is $1680. He will break even when he sells 40 cds in a month. Find Phill's monthly cost, revenue, and profit functions.

16. Mark's Lemonade Stands, which has a stand in front of all of the Walmarts in Houston, has a cost function of $C(x) = 240x + 2405$ and a revenue function of $R(x) = 500x$. The cost and revenue functions have units of dollars where x is measured in thousand of cups sold.

    (a) Find the profit function.

    (b) How many cups of lemonade must be produced in order to break even? (be careful of the units)

    (c) What will the revenue be at this level of production?

17. Rita's Bike Shop has noticed that when the bikes are priced at $159 only 10 bikes are sold and 40 bikes are sold when the price is $99 (based on past result of the sales on ten-speed bikes). Assuming that this information is linear, find the demand equation.

18. If an ipod costs $400, 2000 sell. If the price increases to $500, then 1500 sell. The producer is willing to provide 700 ipods if the price is $580 and are willing to provide 1300 ipods when the is $940. Assume supply and demand are linear.

    (a) Find the supply equation.

    (b) Find the demand equation.

    (c) Find the equilibrium point.

19. Find the equilibrium quantity and the equilibrium price for the supply and demand equations. x is measured in thousand of items and price is measured in dollars.

    Demand: $26700x + 329y - 315182 = 0$
    Supply: $1100x - 47y + 12690 = 0$

20. An on-line tennis site has found that when a certain type of racket is priced at $120 then 8 thousand rackets are demanded and for a price of $230 then 3 thousand rackets are demanded. The supply equation is $x - 40p + 3568 = 0$. p is the price of the rackets in dollars and x is the number of rackets.

    (a) Assuming the demand function is linear, find the demand equation.

    (b) Find the equilibrium quantity.

    (c) Find the equilibrium price.

21. Markers Are Us has, with much studying, found that when the price is $16 then 8 thousand markers are demanded and for a price of $31 then 3 thousand markers are demanded. The supply equation is $2x - p + 10 = 0$. p is the price of the markers in dollars and x is the number of markers in thousands.

    (a) Assuming the demand function is linear, find the demand equation.

    (b) Find the equilibrium quantity.

    (c) Find the equilibrium price.

22. The supplier of Krispy Kritters cereal will not market Krispy Kritters if the price per box is $1.50 or less. If the price is $3.00 per box, they will make 600 boxes available per week.

    (a) Find the supply function. Let x be the number of boxes supplied.

    (b) The weekly demand function for Krispy Kritters cereal is given by $x + 200p = 600$. What is the equilibrium quantity for Krispy Kritters cereal?