

1. Let  $f(x) = \frac{1}{x-1}$ . Find the following:

- a.  $f(-3)$                       b.  $f\left(\frac{1}{2t}\right)$                       c.  $f(x) = 5$                       d.  $f(0)$

2. Consider the information in the table:

- a. Could  $t$  be a function of  $s$ ? Explain.  
b. Could  $s$  be a function of  $t$ ? Explain.

$s$	3	0	1	-1	6	0	7
$t$	-2	5	3	1	2	7	11

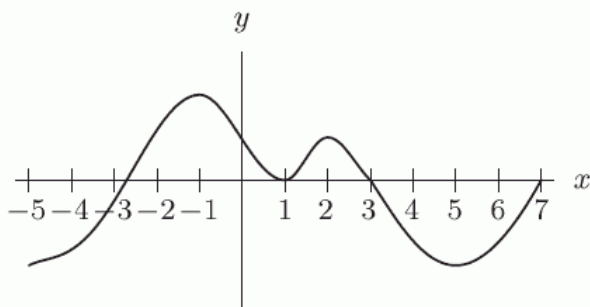
3. Find the equation of a line that is perpendicular to  $y = -\frac{3}{7}x + 2$  and passes through the point  $(-3, 5)$ .

4. Find the equation of a line that is parallel to  $y = -\frac{3}{7}x + 2$  and passes through the point  $(-3, 5)$ .

5. Find the average rate of change of  $f(x) = 2x^2 + 1$  between the points:

- a.  $(1, f(1))$  and  $(2, f(2))$   
b.  $(x, f(x))$  and  $(x+h, f(x+h))$

6. On what interval(s) is the function graphed in the figure below increasing?



7. State the domain and range for the following functions:

a.  $f(x) = -\sqrt{x+7}$     b.  $f(x) = \frac{5}{(x+3)^2}$     c.  $f(x) = \sqrt{8-x}$     d.  $f(x) = -x^2 - 6$

e.  $f(x) = \frac{2}{x+7}$     f.  $f(x) = \frac{1}{\sqrt{x-2}}$

8. A movie theater seats 200 people. For any particular show, the amount of money the theater makes is a function of the number of people,  $n$ , in attendance. If a ticket costs \$9.00, find the domain and range of this function.

9. The cost of a Frigbox refrigerator is \$950, and it depreciates \$50 each year. The cost of a new Arctic Air refrigerator is \$1200, and its value depreciates linearly to \$900 in three years.

- a. Write a formula for the value of the Frigbox refrigerator,  $F$ , in terms of its age,  $t$ , in years.  
b. Write a formula for the value of the Arctic Air refrigerator,  $A$ , in terms of its age,  $t$ , in years.  
c. If a Frigbox and an Arctic Air are bought at the same time, when do the two refrigerators have equal value?  
d. If both refrigerators continue to depreciate at the same rates, what happens to the values of the refrigerators in 20 years time and what does this mean?

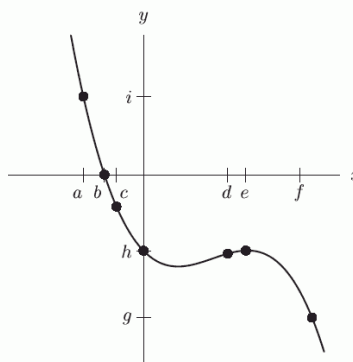
10. At a price of \$2.05 per gallon, the average weekly demand by consumers for gasoline is 43 gallons. If the price rises to \$2.80 per gallon, the weekly demand drops to 28 gallons.
- Find a formula for  $Q$ , the weekly quantity of gasoline demanded, as a function of  $p$ , the price per gallon, assuming that demand is linear.
  - What is the economic significance of the slope of your formula (*explain the slope*)?
  - What is the  $Q$ -intercept and the  $p$ -intercept for your formula?
  - What is the economic interpretation of each; the  $Q$ -intercept and  $p$ -intercept (*explain the intercepts from part b*)?
  - Are these interpretations realistic?
11. The wild rabbits of Australia have recently been seriously threatened by a virus that was accidentally released into their population. (The rabbits themselves were released into Australia decades ago, and have become serious pets. The decimation by the virus is not being viewed by many as a bad thing.) Suppose that the following table gives the number of rabbits,  $r$ , in millions remaining  $t$  months after the release of the virus.

$t$ (months)	2	4	6	8	10	12	14	16	18	20
$r$ (rabbits)	1940	1842	1649	1328	1140	898	765	502	296	104

- Find the equation of the regression line for this data.
  - Do you believe that the linear model found in part a fits the data well? Justify your answer.
  - Use the linear model found in part a to estimate the rabbit population 15 months after the release of the virus. Round your answer to the nearest million rabbits, and be sure to include units.
  - Interpret the slope (*explain*).
  - Find and explain the physical interpretation of the intercepts of the graph of the line found in part a?
  - Would you expect this model to be useful to estimate the rabbit population before time  $t = 0$ ? What about after time  $t = 22$ ? Give reasons.
12. If  $A = 65 + 1.7t$  and  $B = 26 + 4.1t$  represent the population, in millions, of two countries,  $A$  and  $B$ , then in what year,  $t$ , will:
- The population of country  $A$  equal the population of country  $B$ ?
  - Country  $A$  have 30 million more people than in country  $B$ ?
  - Country  $A$  have twice as many inhabitants as country  $B$ ?

13. Let  $y = p(x)$  be defined by the graph on the right.

- Solve  $p(x) = 0$
- Find  $p(a)$

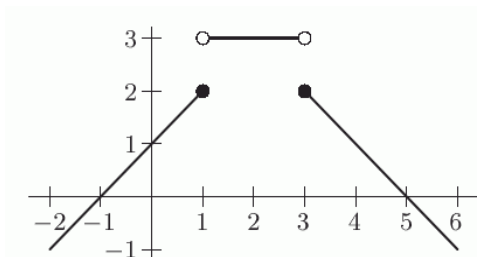


14. The cost,  $C$ , in thousands of dollars, of producing  $q$ , kg of a chemical is given in the table below.

$q$	0	100	200	300	400	500
$C = f(q)$	100	120	140	160	180	200

- Find and explain  $f(200)$  in practical terms?
  - Assume  $f$  is invertible. Find and interpret  $f^{-1}(100)$ .
  - Solve and interpret  $f(q) = 100$ .
  - Does this table represent a linear function? Explain or show work to support your answer.
15. If  $h(x) = \begin{cases} -3 & \text{if } x < -2 \\ x-5 & \text{if } x \geq -2 \end{cases}$
- Evaluate  $h(-2)$
  - Evaluate  $h(-3)$
  - What is the domain of  $h(x)$ ?
  - What is the range of  $h(x)$ ?
  - Graph the function  $h(x)$ ?

16. What is a possible formula for the function graphed below?



17. The cost,  $C$ , in thousands of dollars, of producing  $q$ , kg of a chemical is given by

$$C = f(q) = 100 + 0.2q.$$

- Find a formula for the inverse function.
  - Find and interpret  $f^{-1}(115)$
18. If  $f(x) = 4x + 3$  and  $g(x) = x^2 - 1$  find:
- $f(g(-3))$
  - $f(g(x))$
  - $g(f(x))$
  - $f(f(x))$
19. Does the graph of the function in the following table appear to be concave up, concave down, or neither. Explain your answer.

$t$	0	1	2	3	4
$f(t)$	20	10	6	3	1