

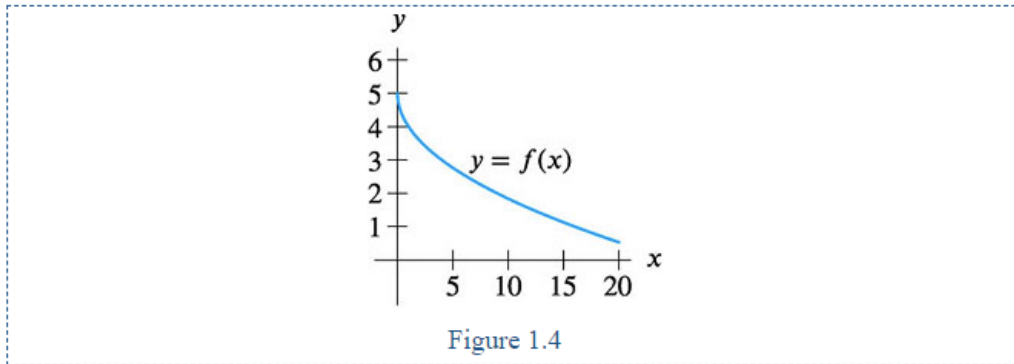
Section 1.1 What is a function?

1. The number, N , of napkins used in a restaurant is $N = f(C) = 2C$, where C is the number of customers. What is the dependent variable? The independent variable?
2. A silver mine's profit, P , is $P = g(s) = -300,000 + 50,000s$ dollars, where s is the price per ounce of silver. What is the dependent variable?
5. The cost in dollars of tuition, T , at most colleges is a function $T = f(c)$ of the number of credits taken, c .
 - (a) Identify the independent and dependent variables.

(b) Give the meaning of:

- (i) $f(3) = 3000$ (ii) $f(12) = f(16)$

7. (a) Use the graph of $f(x) = 5 - \sqrt{x}$ in Figure 1.4 to estimate:



- (i) $f(0)$; (ii) $f(10)$; (iii) $f(16)$

(b) Use the formula for f to evaluate:

- (i) $f(0)$; (ii) $f(10)$; (iii) $f(16)$ (iv) $f(20)$

10. Let $g(x) = (12 - x)^2 - (x - 1)^3$. Evaluate:

- (a) $g(2)$
- (b) $g(5)$
- (c) $g(0)$
- (d) $g(-1)$

In problem 12 -17, evaluate the function given that

$$f(x) = \frac{2x+1}{3-5x} \quad \text{and} \quad g(y) = \frac{1}{\sqrt{y^2+1}}.$$

14. $g(-1)$

15. $f(10)$

16. $f(1/2)$

17. $g(8\sqrt{8})$

In problems 18 – 23, evaluate the function $h(t) = 10 - 4t$

18. $h(r)$

19. $h(2u)$

20. $h(k-3)$

21. $h(4-n)$

22. $g(5t^2)$

26. The sales tax on an item is 6%. Express the total cost, C , in terms of the price of the item, P .

34. The braking distance of a car is the distance a car travels from the time the brakes are applied to the time the car comes to a complete stop. Let $d = g(v)$ be the distance a car traveling at v miles per hour. Explain the meaning of the following statements.

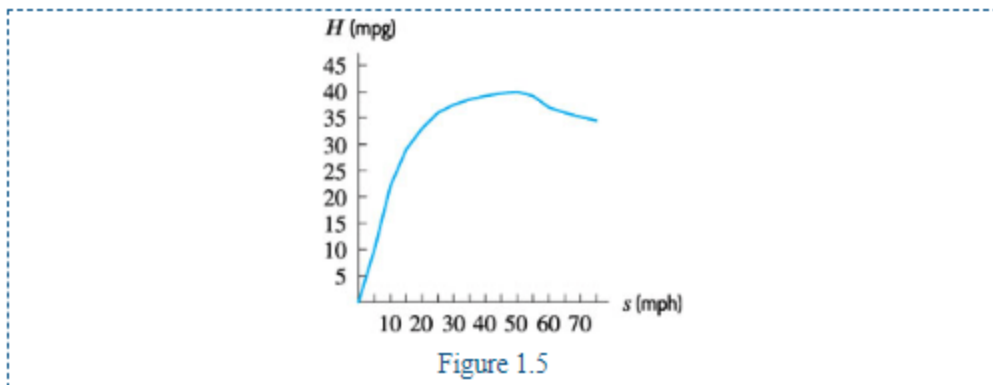
(a) $g(30) = 111$

(b) $g(a) = 10$

(c) $g(10) = b$

(d) $s = g(v)$

35. Figure 1.5 shows the graph of a function giving the highway gas mileage of a car (in miles per gallon), H , as a function of the car's speed (in miles per hour).



(a) Estimate the highway gas mileage if the car is going 60 miles per hour.

ANSWER ⊕

(b) At what speed should you drive in order to maximize the car's fuel efficiency?

ANSWER ⊕

36. A corporate bond has a face value of p dollars. The interest each year is 5% of the face value. After t years the total interest is the product of the

(a) Express the total interest I , in dollars, as a function of the age t , in years, of the bond.

(b) Express the payout P , in dollars, as a function of t .

43. The price of apartments near a subway is given by

$$\text{Price} = \frac{1000 \cdot A}{10d} \text{ dollars,}$$

where A is the area of the apartment in square feet and d is the distance in miles from the subway. Which letters are constants and which are variables?

(a) You want an apartment of 1000 square feet?

(b) You want an apartment 1 mile from the subway?

(c) You want an apartment that costs \$ 200,000?

Exercises for Section 1.2

IDENTIFYING ALGEBRAIC STRUCTURE

■ In Exercises 1-11, say whether the value of the expression increases, decreases, or does not change as x starts at 1 and increases. Assume A is a positive constant.

1. $A + x$

2. $A - 3x$

3. $x - A$

4. Ax

5. $-2Ax$

6. A/x

7. x/A

8. $-Ax^2$

9. $(-Ax)^2$

PROBLEMS

20. The number of gallons left in a gas tank after driving d miles is given by $G(d) = 17 - 0.05d$.

- (a) Which is larger, $G(50)$ or $G(100)$?
- (b) Explain your answer in terms of the expression for $G(d)$, and give a practical interpretation.

21. If you drive to work at v miles per hour, the time available for breakfast is $B(v) = 30 - 480/v$ minutes.

- (a) Which is greater, $B(35)$ or $B(45)$?

ANSWER ⊕

WORKED SOLUTION ⊕

- (b) Explain your answer in terms of the expression for $B(v)$ and give a practical interpretation.

WORKED SOLUTION ⊕

22. In Example 2, Bernardo's trip time T , in hours, is a function of his average speed r , in miles per hour, which is given by

$$T = f(r) = \frac{400}{r}.$$

- (a) Make a table of values for $r = 10, 25, 80, 100,$ and 200 , and graph the function.
- (b) Sketch a graph of $T = f(r)$. Determine the behavior of T values as r gets larger.
- (c) Use the expression defining $T = f(r)$ to explain its behavior as r gets larger.

23. In Example 3 the tip T , in dollars, for a meal with a bill of B dollars is given by the function

$$T = f(B) = 0.2B.$$

Pares says she has an easy way to figure out the tip: she moves the decimal point in the bill one place to the left, then doubles the answer.

(a) Check that Pares' method gives the same answer on bill amounts of \$8.95 and \$23.70 as evaluating the expression $f(B) = 0.2B$ at $B = 8.95$ and $B = 23.70$.

(b) Write an expression for Pares' method. Does her method define the same function as f ? Explain your answer using algebraic structure.

24. To convert kilograms to pounds, Abby halves the number of kilograms, n , then subtracts 10% from the result of that calculation, whereas Renato multiplies the number of kilograms by 2.2.

(a) Write an algebraic expression for each method.

(b) Do the methods give the same answer?

25. Let $f(x) = 2x^2$ and $g(x) = (2x)^2$.

(a) Sketch the graphs of the functions on the same coordinate axes. Do the graphs appear to be the same or different?

WORKED SOLUTION ↻

(b) Using the expression defining the functions and algebraic operations, verify your answer in part (a).

WORKED SOLUTION ↻

26. (a) Say in words how to compute an output value of $f(x) = (x - 2)^2 + 3$ corresponding to an input.

(b) Use your answer in part (a) to determine whether the function f has a maximum and/or minimum value based on the algebraic structure of the function.

Section 1.3 Functions and Equations

In the following equations, find a solution without performing any manipulations.

1. $10 - y = 13$

2. $\frac{w}{4} = \frac{7}{4}$

3. $\sqrt{x + 1} = 7$

4. $7 + z^2 = 7$

In each of the following explain why there is no solution:

5. $\sqrt{x + 8} = -4$

6. $\sqrt{x + 1} = 7$

7. $-5x^2 = 13$

8. $\frac{3}{x+1} = 0$