Exercises

1. If $f(t) = t^2 - 4$, **(a)** Find $f(0)$ **(b)** Solve $f(t) = 0$.

2. If $g(x) = x^2 - 5x + 6$, **(a)** Find $g(0)$ **(b)** Solve $g(x) = 0$.

3. If $g(t) = \dfrac{1}{t+2} - 1$, **(a)** Find $g(0)$ **(b)** Solve $g(t) = 0$.

4. If $h(x) = ax^2 + bx + c$, find $h(0)$.

5. If $g(x) = -\frac{1}{2}x^{1/3}$, find $g(-27)$.

6. Let $f(x) = \dfrac{2x+1}{x+1}$. For what value of x is $f(x) = 0.3$?

If $p(r) = r^2 + 5$, evaluate the expressions in Exercises 7–8.

7. $p(7)$

8. $p(x) + p(8)$

In Figure 2.2, mark the point(s) representing the statements in Exercises 9–12 and label their coordinates.

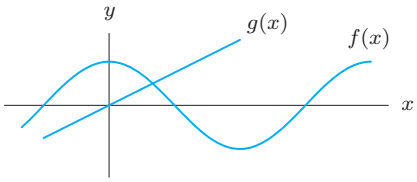

Figure 2.2

9. $f(0) = 2$

10. $f(-3) = f(3) = f(9) = 0$

11. $f(2) = g(2)$

12. $g(x) > f(x)$ for $x > 2$

Problems

13. Let $F = g(t)$ be the number of foxes in a park as a function of t, the number of months since January 1. Evaluate $g(9)$ using Table 1.3 on page 5. What does this tell us about the fox population?

14. Let $F = g(t)$ be the number of foxes in month t in the national park described in Example 5 on page 5. Solve the equation $g(t) = 75$. What does your solution tell you about the fox population?

15. Let $f(x) = 3 + 2x^2$. Find $f\left(\dfrac{1}{3}\right)$ and $\dfrac{f(1)}{f(3)}$. Are they equal?

16. Let $g(x) = x^2 + x$. Find formulas for the following functions. Simplify your answers.

(a) $g(-3x)$ **(b)** $g(1-x)$ **(c)** $g(x+\pi)$
(d) $g(\sqrt{x})$ **(e)** $g(1/(x+1))$ **(f)** $g(x^2)$

17. Let $f(x) = \dfrac{x}{x-1}$.

(a) Find and simplify

(i) $f\left(\dfrac{1}{t}\right)$ (ii) $f\left(\dfrac{1}{t+1}\right)$

(b) Solve $f(x) = 3$.

18. **(a)** Using Figure 2.3, fill in Table 2.2.

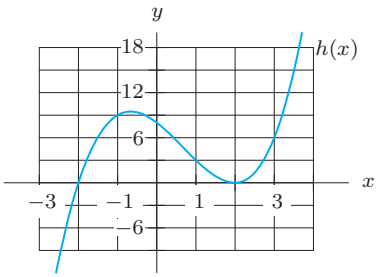

Figure 2.3

Table 2.2

x	-2	-1	0	1	2	3
$h(x)$						

(b) Evaluate $h(3) - h(1)$ (c) Evaluate $h(2) - h(0)$
(d) Evaluate $2h(0)$ (e) Evaluate $h(1) + 3$

19. A ball is thrown up from the ground with initial velocity 64 ft/sec. Its height at time t is

$$h(t) = -16t^2 + 64t.$$

(a) Evaluate $h(1)$ and $h(3)$. What does this tell us about the height of the ball?
(b) Sketch this function. Using a graph, determine when the ball hits the ground and the maximum height of the ball.

20. Let $v(t) = t^2 - 2t$ be the velocity, in ft/sec, of an object at time t, in seconds.

(a) What is the initial velocity, $v(0)$?
(b) When does the object have a velocity of zero?
(c) What is the meaning of the quantity $v(3)$? What are its units?

21. Let $s(t) = 11t^2 + t + 100$ be the position, in miles, of a car driving on a straight road at time t, in hours. The car's velocity at any time t is given by $v(t) = 22t + 1$.

(a) Use function notation to express the car's position after 2 hours. Where is the car then?

(b) Use function notation to express the question, "When is the car going 65 mph?"
(c) Where is the car when it is going 67 mph?

22. Use the letters a, b, c, d, e, h in Figure 2.4 to answer the following questions.

(a) What are the coordinates of the points P and Q?
(b) Evaluate $f(b)$.
(c) Solve $f(x) = e$ for x.
(d) Suppose $c = f(z)$ and $z = f(x)$. What is x?
(e) Suppose $f(b) = -f(d)$. What additional information does this give you?

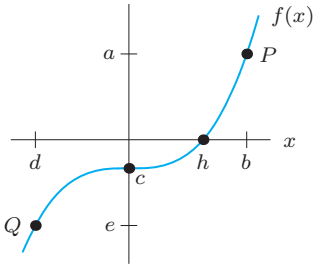

Figure 2.4

23. New York state income tax is based on taxable income, which is part of a person's total income. The tax owed to the state is calculated using the taxable income (not total income). In 2009, for a single person with a taxable income between \$20,000 and \$200,000, the tax owed was \$973 plus 6.85% of the taxable income over \$20,000.[2]

(a) Compute the tax owed by a lawyer whose taxable income is \$68,000.
(b) Consider a lawyer whose taxable income is 80% of her total income, \$$x$, where x is between \$85,000 and \$120,000. Write a formula for $T(x)$, the taxable income.
(c) Write a formula for $L(x)$, the amount of tax owed by the lawyer in part (b).
(d) Use $L(x)$ to evaluate the tax liability for $x = 85{,}000$ and compare your results to part (a).

24. **(a)** Complete Table 2.3 using

$$f(x) = 2x(x-3) - x(x-5) \quad \text{and} \quad g(x) = x^2 - x.$$

What do you notice? Graph these two functions. Are the two functions the same? Explain.
(b) Complete Table 2.4 using

$$h(x) = x^5 - 5x^3 + 6x + 1 \quad \text{and} \quad j(x) = 2x + 1.$$

What do you notice? Graph these two functions. Are the two functions the same? Explain.

[2] www.nystax.gov, accessed January 4, 2010.

Table 2.3

x	-2	-1	0	1	2
$f(x)$					
$g(x)$					

Table 2.4

x	-2	-1	0	1	2
$h(x)$					
$j(x)$					

Problems 25–26 concern $v = r(s)$, the eyewall wind profile of a hurricane at landfall, where v is the eyewall wind speed (in mph) as a function of s, the height (in meters) above the ground. (The eyewall is the band of clouds that surrounds the eye of the storm.) Let s_0 be the height at which the wind speed is greatest, and let $v_0 = r(s_0)$. Interpret the following in terms of the hurricanes.

25. $r(0.5s_0)$ **26.** $r(s) = 0.75v_0$

27. Let $h(x) = x^2 + bx + c$. Evaluate and simplify:
(a) $h(1)$ **(b)** $h(b+1)$

28. If $g(x) = x\sqrt{x} + 100x$, evaluate without a calculator
(a) $g(100)$ **(b)** $g(4/25)$ **(c)** $g(1.21 \cdot 10^4)$

In Problems 29–31, if $f(x) = \dfrac{ax}{a+x}$, find and simplify

29. $f(a)$ **30.** $f(1-a)$ **31.** $f\left(\dfrac{1}{1-a}\right)$

32. Values of f and g are given in Table 2.5.

(a) Evaluate $f(1)$ and $g(3)$.
(b) Describe in full sentences the patterns you see in the values for each function.
(c) Assuming that the patterns you observed in part (b) hold true for all values of x, calculate $f(5)$, $f(-2)$, $g(5)$, and $g(-2)$.
(d) Find possible formulas for $f(x)$ and $g(x)$.

Table 2.5

x	-1	0	1	2	3	4
$f(x)$	-4	-1	2	5	8	11
$g(x)$	4	1	0	1	4	9