Chapter 1

1. Compute the indicated value of the given function.
$$f(x) = 2x^2 - x; \quad f(-1)$$
Ans: 3
Difficulty: easy Section: 1.1

2. Compute the indicated value of the given function.
$$f(x) = 3x^2 - 2; \quad f(-1)$$
Ans: 1
Difficulty: easy Section: 1.1

3. Compute the indicated values of the given function.
$$f(x) = x - 3 + |x - 5|; \quad f(-4), \quad f(-3), \quad f(-2).$$
A) 8, 8, 8 B) –2, –2, –2 C) –6, –4, –2 D) 2, 2, 2
Ans: D Difficulty: easy Section: 1.1

4. Compute the indicated value of the given function.
$$f(x) = |x - 3| + x - 5; \quad f(2)$$
A) –4 B) 2 C) –2 D) 1
Ans: C Difficulty: moderate Section: 1.1

5. Compute the indicated value of the given function.
$$f(x) = |x + 2| + 3|x - 1|; \quad f(-3)$$
A) 13 B) –133 C) 9 D) 23
Ans: A Difficulty: moderate Section: 1.1

6. Compute the indicated value of the given function.
$$f(t) = \begin{cases} -2t + 7 & \text{if } t < -1 \\ t^2 + 8 & \text{if } t \geq -1 \end{cases}; \quad f(-3)$$
A) 13 B) 1 C) 17 D) –1
Ans: A Difficulty: easy Section: 1.1

7. Compute the indicated value of the given function.
$$f(x) = \begin{cases} x^2 - 1 & \text{if } x < 1 \\ 3 & \text{if } x = 1 \\ 2 - 5x & \text{if } x > 1 \end{cases}; \quad f(2)$$
Ans: –8
Difficulty: moderate Section: 1.1

8. Compute the indicated value of the given function.

$$f(x)=\begin{cases} x^2-5 & \text{if } x<1 \\ 4 & \text{if } x=1 \\ 7-2x & \text{if } x>1 \end{cases}; \quad f(2)$$

Ans: 3
Difficulty: moderate Section: 1.1

9. Determine the domain of the given function.

$$f(x)=\frac{x^2-9}{x+2}$$

A) all real numbers x
B) all real numbers x except $x = -2$
C) all real numbers x except $x = 3$ and $x = 7$
D) all real numbers x except $x = 3$, $x = -3$, and $x = -2$
Ans: B Difficulty: easy Section: 1.1

10. Determine the domain of the given function.

$$f(x)=x^4+2x^3+3x+1$$

A) all real numbers x
B) all real numbers x except $x = 1$
C) all real numbers x except $x = -1$
D) all real numbers x except $x = 0$
Ans: A Difficulty: easy Section: 1.1

11. Determine the domain of the given function.

$$f(x)=x^4+7x^3+8x+8$$

Ans: all real numbers x
Difficulty: easy Section: 1.1

12. Determine the domain of the given function.

$$f(x)=\sqrt{2x-3}$$

Ans: All real numbers x for which $x \geq \frac{3}{2}$
Difficulty: moderate Section: 1.1

13. Determine the domain of the given function.

$$f(x)=\sqrt{x-3}$$

A) all real numbers x
B) all real numbers x except $x = 3$
C) all real numbers x for which $x \geq 3$
D) all real numbers x for which $x \geq -3$
Ans: C Difficulty: hard Section: 1.1

14. Determine the domain of the given function.

$$f(t)=\frac{\sqrt{t^2-1}}{t-3}$$

Ans: All real numbers t for which $t \geq 1$ or $t \leq -1$ except $t = 3$
Difficulty: hard Section: 1.1

15. Determine the domain of the given function.

$$f(t)=\frac{\sqrt{t^2-1}}{t-2}$$

Ans: All real numbers t for which $t \geq 1$ or $t \leq -1$ except $t = 2$.
Difficulty: hard Section: 1.1

16. Find the composite function $f\left(g\left(x\right)\right)$.

$$f(u)=u^3+2,\ g(x)=x+3$$

A) $f(g(x))= x^3+5$
B) $f(g(x))=x^3+6$
C) $f(g(x))=x^3+9x^2+27x+27$
D) $f(g(x))=x^3+x+5$

Ans: C Difficulty: easy Section: 1.1

17. Find the composite function $f\left(g\left(x\right)\right)$.

$$f(u)=\frac{1}{u}-u,\ g(x)=2x-3$$

Ans: $f(g(x))= \dfrac{-4x^2+12x-8}{2x-3}$
Difficulty: easy Section: 1.1

18. Find the composite function $f\left(g\left(x\right)\right)$.

$$f(u)=\frac{1}{u},\ \ g\left(x\right)=x+3$$

A) $f(g(x))= \dfrac{1}{x}+3$
B) $f(g(x))= x+3+\dfrac{1}{x}$
C) $f(g(x))= 1+\dfrac{3}{x}$
D) $f(g(x))= \dfrac{1}{x+3}$

Ans: D Difficulty: easy Section: 1.1

19. Find the difference quotient, $\dfrac{f(x+h)-f(x)}{h}$.

$f(x)=\dfrac{9}{x}$

A) $\dfrac{f(x+h)-f(x)}{h}=1$

B) $\dfrac{f(x+h)-f(x)}{h}=9$

C) $\dfrac{f(x+h)-f(x)}{h}=-\dfrac{9}{x(x+h)}$

D) $\dfrac{f(x+h)-f(x)}{h}=\dfrac{9}{x+h}$

Ans: C Difficulty: moderate Section: 1.1

20. Find the indicated composite function.

$f(x+3)$ where $f(x)=\dfrac{1}{x}$

A) $f(x+3)=\dfrac{1}{x+3}$

B) $f(x+3)=\dfrac{1}{x}+3$

C) $f(x+3)=x+3+\dfrac{1}{x}$

D) $f(x+3)=1+\dfrac{3}{x}$

Ans: A Difficulty: easy Section: 1.1

21. Find the indicated composite function.

$f(3x-4)$ where $f(x)=\dfrac{1}{x}-x$

Ans: $f(3x-4)=\dfrac{-9x^2+24x-15}{3x-4}$

Difficulty: easy Section: 1.1

22. Find functions $h(x)$ and $g(u)$ such that $f(x)=g\left(h(x)\right)$:

$f(x)=\sqrt[7]{80-2x-5x^2}$

Ans: $h(x)=80-2x-5x^2$; $g(u)=\sqrt[7]{u}$ is one possible answer.

Difficulty: easy Section: 1.1

23. Find functions $h(x)$ and $g(u)$ such that $f(x)=g\left(h(x)\right)$:

$f(x)=\dfrac{5}{\sqrt{x+4}}+3\sqrt{x+4}$

Ans: $h(x)=x+4$; $g(u)=\dfrac{5}{\sqrt{u}}+3\sqrt{u}$ is one possible answer.

Difficulty: easy Section: 1.1

24. An efficiency study of the morning shift at a certain factory indicates that an average worker who arrives on the job at 8:00 A.M. will have assembled $f(x) = -x^3 + 5x^2 + 16x$ transistor radios x hours later. How many radios will such a worker assemble between 10:00 and 11:00 A.M.?
A) 20 B) 22 C) 15 D) 18
Ans: B Difficulty: moderate Section: 1.1

25. To study the rate at which animals learn, a psychology student performed an experiment in which a rat was sent repeatedly through a laboratory maze. Suppose the time required for the rat to traverse the maze on the nth trial was approximately $T(n) = 5 + \frac{2}{n} - \frac{4}{n^2}$ minutes. How many minutes does it take the rat to traverse the maze on the 2nd trial?
Ans: $T(2) = 5$ min
Difficulty: hard Section: 1.1

26. To study the rate at which animals learn, a psychology student performed an experiment in which a rat was sent repeatedly through a laboratory maze. Suppose the time required for the rat to traverse the maze on the n^{th} trial was approximately $T(n) = 4 + \frac{8}{n} - \frac{16}{n^2}$ minutes. How long does it take the rat to traverse the maze in the second trial?
Ans: $T(2) = 4$ minutes
Difficulty: hard Section: 1.1

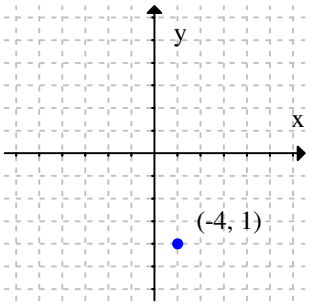
27. A ball is thrown upward in such a way that t seconds later, it is $H(t) = -16t^2 + 64t + 80$ feet above the ground. How many seconds later does the ball hit the ground?
Ans: $H(t) = 0$ at $t = 5$ seconds
Difficulty: hard Section: 1.1

28. A ball is thrown upward in such a way that t seconds later it is $H(t) = -15t^2 + 60t + 75$ feet above the ground. When does the ball hit the ground?
Ans: $H(t) = 0$ at $t = 5$ seconds.
Difficulty: hard Section: 1.1

29. At a certain factory, the total cost of manufacturing q units during the daily production run is $C(q) = q^2 + 2q + 297$ dollars. On a typical workday, $q(t) = 17t$ units are manufactured during the first t hours of a production run. How many dollars are spent during the first 3 hours of production?
Ans: $3,000
Difficulty: hard Section: 1.1

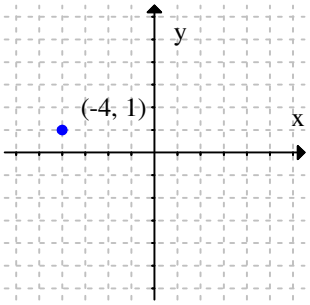
30. At a certain factory, the total cost of manufacturing units during the daily production run is $C(q) = q^2 + 2q + 260$ dollars. On a typical day, $q(t) = 15t$ units are manufactured during the first hours of a production run. How much is spent during the first 3 hours of production?
Ans: $2,375
Difficulty: hard Section: 1.1

31. Plot the given point in a rectangular coordinate system.
(–4, 1)



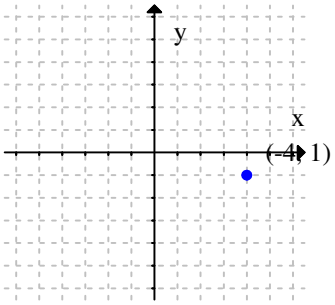
A)

(*Each gridline represents one unit.*)



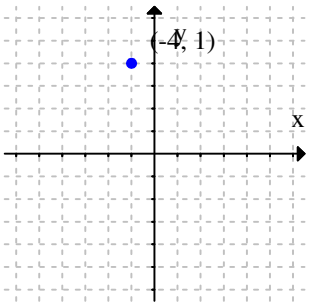
B)

(*Each gridline represents one unit.*)



C)

(*Each gridline represents one unit.*)

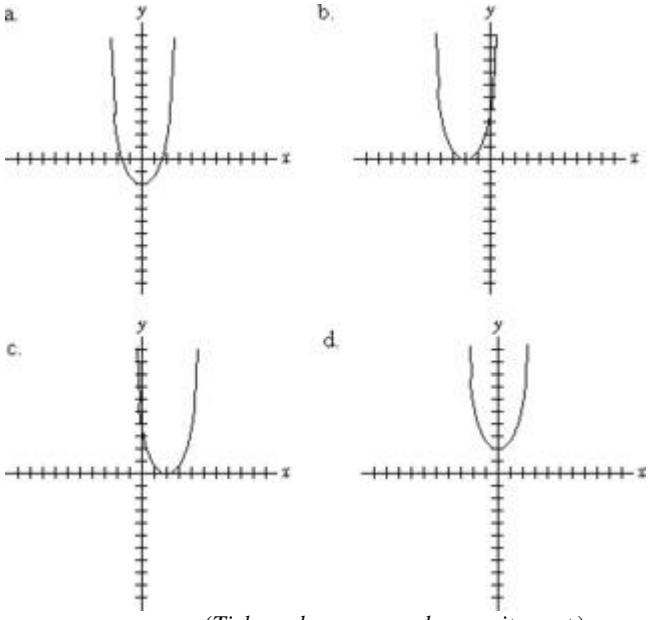


D)

(*Each gridline represents one unit.*)
Ans: B Difficulty: easy Section: 1.2

32. Find the distance between the given points.
(4, 8) and (–8, 7)
A) $D = \sqrt{13}$ B) $D = 13$ C) $D = 145$ D) $D = \sqrt{145}$
Ans: D Difficulty: easy Section: 1.2

33. Sketch the graph of the given function.
$f(x) = x^2 + 2$



(*Tick marks are spaced one unit apart.*)
A) Graph a B) Graph b C) Graph c D) Graph d
Ans: D Difficulty: moderate Section: 1.2

34. Find the points of intersection (if any) of the given pair of curves.
$y = 3x - 1$ and $y = 3 - 5x$
Ans: $\left(\frac{1}{2}, \frac{1}{2}\right)$
Difficulty: easy Section: 1.2

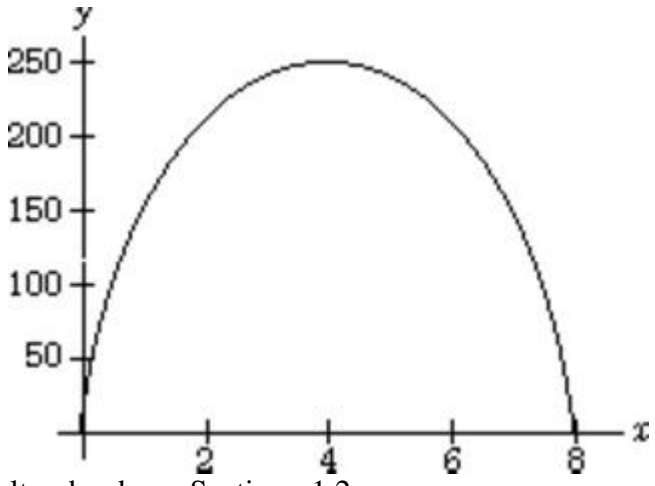
35. Find the points of intersection (if any) of the given pair of curves.
$y = x + 8$ and $y = 2x + 4$
A) (4, 12) B) (1, –4) C) (0, 6) D) (12, 20)
Ans: A Difficulty: moderate Section: 1.2

36. Find the points of intersection (if any) of the given pair of curves.
$y = 6x - 1$ and $y = 2x - 8$
Ans: $\left(-\frac{7}{4}, -\frac{23}{2}\right)$
Difficulty: easy Section: 1.2

37. Find the points of intersection (if any) of the given pair of curves.
$y = x + 3$ and $y = 2x + 4$
A) (1, –4) B) (–1, 2) C) (0, 3) and (1, 4) D) (1, 6)
Ans: B Difficulty: moderate Section: 1.2

38. Find the points of intersection (if any) of the given pair of curves.
$y = x^2$ and $y = 3x - 2$.
A) (0,0) B) There are no points of intersection. C) (2, 4) D) (1, 1), (2, 4)
Ans: D Difficulty: moderate Section: 1.2

39. If an object is thrown vertically upward with an initial speed of 128 ft/sec, its height (in feet) t seconds later is given by $H(t) = -16t^2 + 128t$. Graph the function $H(t)$ and use the graph to determine when the object will hit the ground.
Ans: 8 seconds



Difficulty: hard Section: 1.2

40. A ball is thrown upward in such a way that t seconds later, it is $s = -16t^2 + 96t + 144$ feet above the ground. Sketch the graph of $s(t)$ and determine the maximum height in feet attained by the ball.
Ans: 288 ft
Difficulty: hard Section: 1.2

41. Find the slope (if possible) of the line that passes through the given pair of points.
(–1, 5) and (7, 2)

Ans: $-\frac{3}{8}$

Difficulty: easy Section: 1.3

42. Find the slope (if possible) of the line that passes through the given pair of points.
(5, 0) and (3, 4)

A) –2 B) 2 C) $-\frac{1}{2}$ D) $\frac{1}{2}$

Ans: A Difficulty: easy Section: 1.3

43. Find the slope (if possible) of the line that passes through the given pair of points.
(12, 0) and (16, 17)

A) $\frac{17}{4}$ B) $\frac{4}{17}$ C) $-\frac{4}{17}$ D) $-\frac{17}{4}$

Ans: A Difficulty: easy Section: 1.3

44. Find the slope (if possible) of the line that passes through the given pair of points.
(0, 5) and (8, 7).

A) 4 B) $\frac{1}{4}$ C) 0 D) The slope is undefined.

Ans: B Difficulty: easy Section: 1.3

45. Find the slope (if possible) of the line that passes through the given pair of points.
(6, 4) and (9, –4).

Ans: $-\frac{8}{3}$

Difficulty: easy Section: 1.3

46. Find the slope of the line passing through (6, –9) and (2, 8). Round your answer to two decimal places, if necessary.

A) –4.25 B) –0.24 C) 0.24 D) 4.25

Ans: A Difficulty: easy Section: 1.3

47. Find the slope and *y*-intercept of the line whose equation is given.
$5y = 8x$

A) slope 8, *y*-intercept 0

B) slope 8, *y*-intercept 5

C) slope $\frac{8}{5}$, *y*-intercept 0

D) slope $-\frac{8}{5}$, *y*-intercept 0

Ans: C Difficulty: moderate Section: 1.3

48. Find the slope and y-intercept (if they exist) of the line $7y = 2x$.

A) Slope is $\frac{2}{7}$ and y-intercept is 0.

C) Slope is 2 and y-intercept is 0.

B) Slope is 2 and y-intercept is 7.

D) Slope is $\frac{7}{2}$ and y-intercept is 0.

Ans: A Difficulty: easy Section: 1.3

49. Find the slope and y-intercept of the line whose equation is given.

$y = 2x - 5$.

A) slope 2, y-intercept –5

C) slope $\frac{1}{2}$, y-intercept –5

B) slope 2, y-intercept 5

D) slope $\frac{1}{2}$, y-intercept 5

Ans: A Difficulty: easy Section: 1.3

50. Find the slope of the line whose equation is given.

$3x + 5y = -7$

Ans: $-\frac{3}{5}$

Difficulty: moderate Section: 1.3

51. Find the slope of the line whose equation is given.

$3x - 5y = 9$.

Ans: $\frac{3}{5}$

Difficulty: moderate Section: 1.3

52. What is the slope of the line $6x + 9y = -7$? Round your answer to two decimal places, if necessary.

A) –1.5 B) 1.5 C) 0.67 D) –0.67

Ans: D Difficulty: easy Section: 1.3

53. Find the slope of the line with the following equation $2x + 3y = -5$.

Ans: Slope: $-\frac{2}{3}$

Difficulty: moderate Section: 1.3

54. Find the slope and y-intercept of the line $7y - 6x = 6$.

Ans: Slope: $\frac{6}{7}$; y-intercept: $\frac{6}{7}$

Difficulty: moderate Section: 1.3

55. Find the slope and y-intercept of the line whose equation is given.

$$\frac{x}{3}+\frac{y}{5}=1$$

Ans: Slope: $-\frac{5}{3}$; y-intercept: 5
Difficulty: hard Section: 1.3

56. Find the slope and y-intercept of the line whose equation is given.

$$\frac{x}{2}+\frac{y}{3}=1$$

A) Slope: $-\frac{3}{2}$; y-intercept: 3
B) Slope: $\frac{3}{2}$; y-intercept: 1
C) Slope: $\frac{1}{2}$; y-intercept: 1
D) Slope: $\frac{3}{2}$; y-intercept: $\frac{1}{2}$

Ans: A Difficulty: moderate Section: 1.3

57. Write an equation for the line through (3, 0) with slope 2.
A) $y = 2x - 6$ B) $y = 2x - 3$ C) $y = 2x + 6$ D) $y = 2x + 3$
Ans: A Difficulty: moderate Section: 1.3

58. Write an equation for the line with the given properties.
Through (3, –1) with slope 2
Ans: $y = 2x - 7$
Difficulty: moderate Section: 1.3

59. Write an equation for the line through (5, 4) and parallel to the x-axis.
A) $x = 5$ B) $x = -5$ C) $y = 4$ D) $y = -4$
Ans: C Difficulty: easy Section: 1.3

60. Find an equation of the line parallel to the line y-axis and through the point (3, 7).
Ans: $x = 3$.
Difficulty: moderate Section: 1.3

61. What is the equation of the line through the points (7, –1) and (1, 15)? Round numbers to two decimal places, if necessary.
A) $y = -0.38x + 17.67$
B) $y = -0.38x + 0.06$
C) $y = -2.67x + 0.06$
D) $y = -2.67x + 17.67$
Ans: D Difficulty: easy Section: 1.3

62. Between August 29 and September 4, 2005, the price of gasoline increased steadily due to the impact of hurricane Katrina. The average price per gallon in Cincinnati on August 29 was \$2.60, and on September 4 if was \$3.10. Write a linear function $C(x)$ that describes the cost per gallon of gas in Cincinnati in terms of days after August 29. Round the slope to three decimal places, if necessary. Use your function to find how much gas would have cost on October 1 if the price had continued to increase at that rate.
Ans: $C(x) = 0.083x + 2.60$; \$5.34
Difficulty: moderate Section: 1.3

63. The cost of renting a backhoe at one distributor is \$325, plus \$35 per day. Write a linear function $C(x)$ that describes the cost of renting the backhoe for x days, then use your function to find how much it would cost to rent it for 6 days.
A) $C(x) = 325x + 35$; \$1,985
B) $C(x) = 6(325 + 35x)$; \$3,210
C) $C(x) = 325 + 35x$; \$535
D) $C(x) = 35x + 319$; \$529
Ans: C Difficulty: easy Section: 1.3

64. Each unit of a certain commodity costs $p = 23x + 24$ cents when x units of the commodity are produced. If all units are sold at this price, express the revenue derived from the sales as a function of x.
A) $x(23x + 24)$ cents
B) $22x + 24$ cents
C) $23x^2 + 24$ cents
D) $24x + 24$ cents
Ans: A Difficulty: hard Section: 1.4

65. A manufacturer's total cost consists of a fixed overhead of \$250 plus production costs of \$70 per unit. Express the total cost in dollars as a function of the number of units produced.
Ans: $C(x) = 70x + 250$
Difficulty: hard Section: 1.4

66. A manufacturer's total cost consists of a fixed overhead of \$100 plus production costs of \$40 per unit. Express the total cost in dollars as a function of the number of units produced.
Ans: $C(x) = 40x + 100$.
Difficulty: hard Section: 1.4

67. A farmer is planning to plant a rectangular garden with an area of 4,000 square yards. The garden is to be fenced on all four sides. Express the number of yards of fencing required as a function of x, the long side of the fence.
Ans: $s = 2x + 2\left(\frac{4,000}{x}\right)$
Difficulty: hard Section: 1.4

68. A farmer is planning to plant a rectangular garden with an area of 6,400 square yards. The garden is to be fenced on all four sides. Express the number of yards of fencing required as a function of x, the long side of the fence.

Ans: $2x + \dfrac{12{,}800}{x}$

Difficulty: hard Section: 1.4

69. A rectangle is constructed inside a circle of radius r with the corners of the rectangle lying on the circle. Express the area A of the rectangle as a function of the radius r if the width of one side of the rectangle is 2.

Ans: $A = 4\sqrt{r^2 - 1}$

Difficulty: moderate Section: 1.4

70. A closed cylindrical can has a surface area of 360π square inches. Express the volume of the can as a function of its radius, r.

A) $V(r) = \pi r(180 - r^2)$ cubic inches C) $V(r) = 360\pi r^2$ cubic inches

B) $V(r) = 180\pi r$ cubic inches D) $V(r) = \pi(180 - r^3)$ cubic inches

Ans: A Difficulty: hard Section: 1.4

71. A cylindrical can is to have a volume of 36π cubic inches. The cost of the material used for the top and bottom of the can is 4 cents per square inch, and the cost of the material used for the curved side is 3 cents per square inch. Express the cost in cents of constructing the can as a function of its radius.

Ans: $C = 8\pi r^2 + \dfrac{216\pi}{r}$

Difficulty: hard Section: 1.4

72. A cylindrical can is to have a volume of 27π cubic inches. The cost of the material used for the top and bottom of the can is 4 cents per square inch, and the cost of the material used for the curved side is 5 cents per square inch. Express the cost of constructing the can as a function of its radius.

Ans: $8\pi r^2 + 270\dfrac{\pi}{r}$ cents

Difficulty: hard Section: 1.4

73. A closed box with a square base is to have a volume of 40 cubic meters. The material for the top and bottom of the box costs \$2 per square meter, and the material for the sides costs \$1 per square meter. Express the construction cost of the box as a function of the length of its base, x.

A) $C(x) = x^2 + 160x + 2$ dollars

B) $C(x) = 2x^2 + \frac{2}{x} + 4$ dollars

C) $C(x) = 2x^2 + \frac{40}{x}$ dollars

D) $C(x) = 4x^2 + \frac{160}{x}$ dollars

Ans: D Difficulty: hard Section: 1.4

74. The supply and demand functions, $S(x)$ and $D(x)$, respectively, for a certain commodity are given in terms of the level of production x. $S(x) = 2x + 30$, $D(x) = 360 - x$. Find the value of x_e for which equilibrium occurs.
Ans: 110
Difficulty: easy Section: 1.4

75. Two car rental agencies are competing. One agency rents cars for 35 dollars per day and 35 cents a mile; the other agency rents cars for 20 dollars per day and 40 cents a mile. For a 3 day trip, how many miles must you travel to have the total cost be the same with each agency? Round to the nearest whole mile , if necessary.
A) 900 miles B) 300 miles C) 43 miles D) 38 miles
Ans: A Difficulty: hard Section: 1.4

76. Two jets bound for San Diego leave Boston 20 minutes apart. The first travels at 450 miles per hour, while the second goes 500 miles per hour. How how many hours after the second plane departs will the second plane pass the first?
Ans: 3 hours after the second plane leaves
Difficulty: hard Section: 1.4

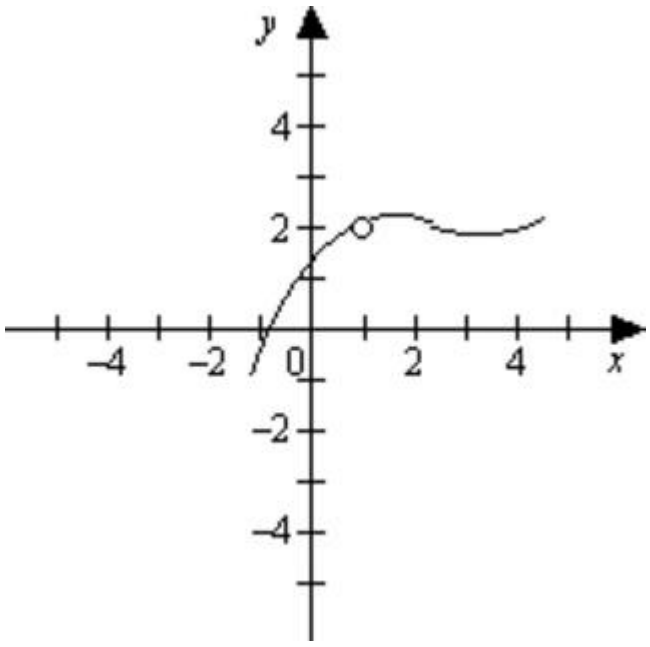
77. Two jets bound for San Diego leave Boston 20 minutes apart. The first plane travels at 240 miles per hour, while the second plane goes 280 miles per hour. At what time will the second plane pass the first?
Ans: 2 hours after the second plane departs.
Difficulty: hard Section: 1.4

78. An appliance manufacturer can sell refrigerators for \$1,500 apiece. The manufacturer's total cost consists of a fixed overhead of \$30,000 plus production cost of \$1,000 per refrigerator. How many refrigerators must be sold for the manufacturer to break even?
Ans: 60
Difficulty: hard Section: 1.4

79. An appliance manufacturer can sell refrigerators for $600 apiece. The manufacturer's total cost consists of a fixed overhead of $12,000 plus production cost of $400 per refrigerator. How many refrigerators must be sold for the manufacturer to break even?
Ans: 60
Difficulty: hard Section: 1.4

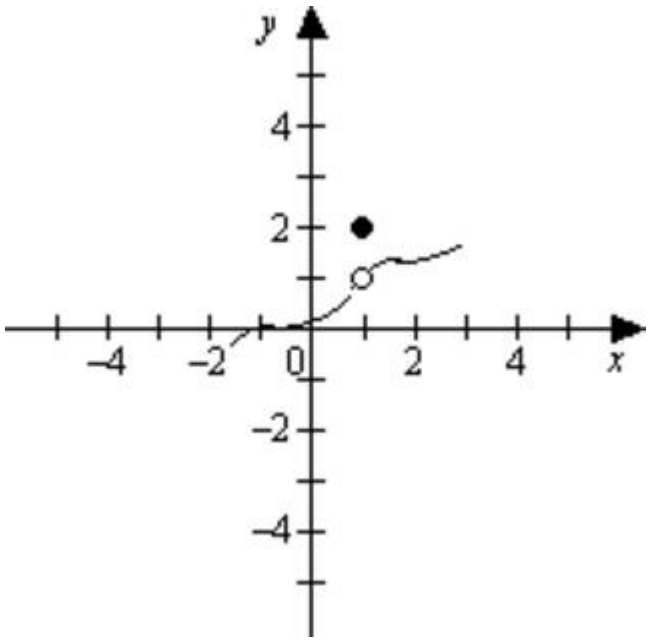
80. A company makes a certain product for $4 each and sells it for $8. If the company has overhead expenses of $10,000 per year, how many of its products must be made and sold to break even?
A) 10,000 B) 20,000 C) 40,000 D) 2,500
Ans: D Difficulty: hard Section: 1.4

81. If $f(x)$ is graphed below, find $\lim_{x \to 1} f(x)$ if it exists.



Ans: 2
Difficulty: moderate Section: 1.5

82. If $f(x)$ is graphed below, find $\lim_{x \to 1} f(x)$ if it exists.



Ans: 1
Difficulty: moderate Section: 1.5

83. Find the indicated limit if it exists.

$$\lim_{x \to 1} (2x^2 - 3x + 1)$$

Ans: 0
Difficulty: easy Section: 1.5

84. Find the indicated limit if it exists.

$$\lim_{x \to 1} \left(6x^2 - 4x + 1\right)$$

Ans: 3
Difficulty: easy Section: 1.5

85. Find the indicated limit if it exists.

$$\lim_{x \to 3} \left(x + 4\right)$$

A) 7 B) 3 C) Does not exist D) –1
Ans: A Difficulty: easy Section: 1.5

86. Find the indicated limit if it exists.

$$\lim_{x \to 1} \frac{2x - 1}{x + 3}$$

Ans: $\frac{1}{4}$
Difficulty: easy Section: 1.5

87. Find the indicated limit if it exists.

$$\lim_{x\to 2}\frac{x-2}{x^2-4}$$

Ans: $\frac{1}{4}$

Difficulty: moderate Section: 1.5

88. Find the indicated limit if it exists.

$$\lim_{x\to 1}\frac{3x^2-5x+2}{2x+1}$$

Ans: 0

Difficulty: easy Section: 1.5

89. Find the indicated limit if it exists.

$$\lim_{x\to 1}\frac{3x-1}{x+7}$$

Ans: $\frac{1}{4}$

Difficulty: easy Section: 1.5

90. Find the indicated limit if it exists.

$$\lim_{x\to 2}\frac{x-2}{x^2-4}$$

Ans: $\frac{1}{4}$

Difficulty: moderate Section: 1.5

91. Find the indicated limit if it exists.

$$\lim_{x\to 1}\frac{x^2+3x+2}{x^2-1}$$

A) $\frac{3}{2}$ B) 3 C) 6 D) Does not exist

Ans: D Difficulty: moderate Section: 1.5

92. Find the indicated limit if it exists.

$$\lim_{x\to 4}\frac{\sqrt{x}-2}{x-4}$$

A) Does not exist B) 4 C) $-\frac{1}{4}$ D) $\frac{1}{4}$

Ans: D Difficulty: hard Section: 1.5

93. Find $\lim_{x\to+\infty} f(x)$ and $\lim_{x\to-\infty} f(x)$. If the limiting value is infinite indicate whether it is $+\infty$ or $-\infty$.

$f(x) = (5 - 2x)(x - 1)$

A) $-\infty, 0$ B) $+\infty, 0$ C) $-\infty, -\infty$ D) $+\infty, +\infty$

Ans: C Difficulty: moderate Section: 1.5

94. Find $\lim_{x\to+\infty} f(x)$ and $\lim_{x\to-\infty} f(x)$. If the limiting value is infinite indicate whether it is $+\infty$ or $-\infty$.

$$f(x) = \frac{2 - 9x^3}{6x^3 + x - 3}$$

A) $-\frac{3}{2}, \frac{3}{2}$ B) $-\frac{3}{2}, -\frac{3}{2}$ C) $+\infty, -\infty$ D) $-\infty, +\infty$

Ans: B Difficulty: moderate Section: 1.5

95. Complete the table by evaluating $f(x)$ at the specified values of x. Then use the table to estimate the indicated limit, or show that it does not exist.

$f(x) = 3x^2 - 13x; \ \lim_{x\to4} f(x)$

x	3.9	3.99	3.999	4	4.001	4.01	4.1
$f(x)$							

Ans:

x	3.9	3.99	3.999	4	4.001	4.01	4.1
$f(x)$	–5.07	–4.1097	–4.010997		–3.988997	–3.8897	–2.87

$\lim_{x\to4} f(x) = -4$

Difficulty: easy Section: 1.5

96. Complete the table by evaluating $f(x)$ at the specified values of x. Then use the table to estimate the indicated limit, or show that it does not exist.

$f(x) = \frac{3x^2 - 48}{x + 4}; \ \lim_{x\to-4} f(x)$

x	–4.1	–4.01	–4.001	–4	–3.999	–3.99	–3.9
$f(x)$							

Ans:

x	–4.1	–4.01	–4.001	–4	–3.999	–3.99	–3.9
$f(x)$	–24.3	–24.03	–24.003		–23.997	–23.97	–23.7

$\lim_{x\to-4} f(x) = -24$

Difficulty: easy Section: 1.5

97. Complete the table by evaluating $f(x)$ at the specified values of x. Then use the table to estimate the indicated limit, or show that it does not exist.

$$f(x)=\frac{5x+7}{x-6};\ \lim_{x\to 6} f(x)$$

x	5.9	5.99	5.999	6	6.001	6.01	6.1
$f(x)$							

Ans:

x	5.9	5.99	5.999	6	6.001	6.01	6.1
$f(x)$	–365	–3,695	–36,995		37,005	3,705	375

$\lim_{x\to 6} f(x)$ does not exist

Difficulty: easy Section: 1.5

98. An efficiency consultant determines that when new workers are hired to wait tables at an upscale restaurant, the average number of tables they can wait on in a 6 hour shift is given by

$$N(x)=\frac{\sqrt{5.3x^2+50x+14}}{0.1x+0.8}$$

where x is the number of shifts they've worked since being hired. What happens to an average waiter's productivity in the long run (as $x\to\infty$)?

A) It approaches 14 tables per shift.
B) It approaches 23 tables per shift.
C) It approaches 53 tables per shift.
D) It increases without bound.

Ans: B Difficulty: moderate Section: 1.5

99. As a rumor spreads across a college campus, the number of people that have heard it can be modeled by the equation

$$N(t)=\frac{6{,}000t^2+2{,}700t}{(t+3)^2}$$

where t is days since the rumor started spreading. What happens to the number of people that have heard the rumor in the long run (as $t\to\infty$)?

Ans: It approaches 6,000.

Difficulty: easy Section: 1.5

100. Find the indicated one-sided limit. If the limiting value is infinite, indicate whether it is $+\infty$ or $-\infty$.

$$\lim_{x\to 4^-}\frac{\sqrt{x}-2}{x-4}$$

A) 2 B) –2 C) $\frac{1}{4}$ D) $-\frac{1}{4}$

Ans: C Difficulty: hard Section: 1.6

101. Find the indicated one-sided limit. If the limiting value is infinite, indicate whether it is $+\infty$ or $-\infty$.

$$\lim_{x\to 36^-} \frac{\sqrt{x}-6}{x-36}$$

Ans: $\dfrac{1}{12}$

Difficulty: hard Section: 1.6

102. Find the indicated one-sided limit. If the limiting value is infinite, indicate whether it is $+\infty$ or $-\infty$.

$$\lim_{x\to 36^-} \frac{\sqrt{x}-6}{x-36}$$

Ans: $\dfrac{1}{12}$

Difficulty: hard Section: 1.6

103. Find the indicated one-sided limit. If the limiting value is infinite, indicate whether it is $+\infty$ or $-\infty$.

$$\lim_{x\to 1^+} \frac{\sqrt{x-1}}{x-1}$$

Ans: $+\infty$

Difficulty: hard Section: 1.6

104. Find the indicated one-sided limit. If the limiting value is infinite, indicate whether it is $+\infty$ or $-\infty$.

$$\lim_{x\to 5^+} \frac{\sqrt{x-5}}{x-5}$$

Ans: $+\infty$

Difficulty: hard Section: 1.6

105. Find the indicated one-sided limit. If the limiting value is infinite, indicate whether it is $+\infty$ or $-\infty$.

$$\lim_{x\to 2^-} f(x) \quad \text{where} \quad f(x)=\begin{cases} x^2 & \text{if } x\le 2 \\ x+1 & \text{if } x>2 \end{cases}$$

Ans: 4

Difficulty: hard Section: 1.6

106. Find the indicated one-sided limit. If the limiting value is infinite, indicate whether it is $+\infty$ or $-\infty$.

$$\lim_{x\to 2^+} f(x) \text{ where } f(x)=\begin{cases} x^2 & \text{if } x\le 2 \\ x+1 & \text{if } x>2 \end{cases}$$

Ans: 3
Difficulty: hard Section: 1.6

107. Find the indicated one-sided limit. If the limiting value is infinite, indicate whether it is $+\infty$ or $-\infty$.

$$\lim_{x\to 2^-} f(x) \text{ where } f(x)=\begin{cases} x+5 & \text{if } x<2 \\ x^2 & \text{if } x\ge 2 \end{cases}$$

A) 7 B) 0 C) 4 D) There is none
Ans: A Difficulty: hard Section: 1.6

108. True or False: $\lim_{x\to 3^-} f(x)=3$ where $f(x)=\begin{cases} x & \text{if } x<3 \\ x+1 & \text{if } x\ge 3 \end{cases}$

A) True B) False
Ans: A Difficulty: hard Section: 1.6

109. Find the indicated one-sided limit. If the limiting value is infinite, indicate whether it is $+\infty$ or $-\infty$.

$$\lim_{x\to 1^-} f(x) \text{ where } f(x)=\begin{cases} x^2 & \text{if } x\le 1 \\ x+3 & \text{if } x>1 \end{cases}$$

Ans: 1
Difficulty: hard Section: 1.6

110. List all values of x for which $f(x)$ is not continuous.

$$f(x)=\frac{14x-21}{x-7}$$

Ans: 7
Difficulty: moderate Section: 1.6

111. List all values of x for which $f(x)$ is not continuous.

$$f(x)=\frac{5x-10}{x-2}$$

Ans: 2
Difficulty: moderate Section: 1.6

112. List all values of x for which $f(x)$ is not continuous.

$$f(x)=\frac{5x+1}{x^2}$$

Ans: 0
Difficulty: moderate Section: 1.6

113. List all values of x for which $f(x)$ is not continuous.

$$f(x)=\frac{2x+1}{x^2+x}\ .$$

A) -1 B) 0 and -1 C) $-\frac{1}{2}$ D) None

Ans: B Difficulty: moderate Section: 1.6

114. List all values of x for which $f(x)$ is not continuous.

$$f(x)=\frac{7x+1}{x^2}$$

Ans: 0
Difficulty: moderate Section: 1.6

115. Find all values of x for which the given function is not continuous.

$$f(x)=\frac{x^2+3x+2}{x^2+4x+3}$$

Ans: -1 and -3
Difficulty: hard Section: 1.6

116. Decide if the given function is continuous at the specified value of x.

$$f(x)=\begin{cases} x+4 & \text{if } x<1 \\ 4x+1 & \text{if } x\geq 1 \end{cases};\quad x=1$$

A) No, the function is not continuous at $x = 1$.
B) Yes, the function is continuous at $x = 1$.
Ans: B Difficulty: easy Section: 1.6

117. List all the values of x for which the given function is not continuous.

$$f(x)=\begin{cases} x^4 & \text{if } x\leq 3 \\ 81 & \text{if } x>3 \end{cases}$$

A) $x = 0$ B) $x = 3$ C) $x = \pm 3$ D) The function is continuous for all values of x.
Ans: D Difficulty: easy Section: 1.6

118. Find all the values of x for which the given function is not continuous.

$$f(x)=\begin{cases} x^2+4 & \text{if } x\le 5 \\ 4 & \text{if } x>5 \end{cases}$$

Ans: 5
Difficulty: moderate Section: 1.6

119. Find all the values of x for which the given function is not continuous.

$$f(x)=\begin{cases} x^2+5 & \text{if } x\le 3 \\ 3 & \text{if } x>3 \end{cases}$$

Ans: 3
Difficulty: moderate Section: 1.6