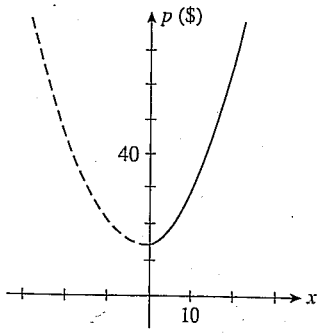
63. a.



Units of a thousand

b. $20

65. a. $\frac{b-d}{c-a}; \frac{bc-ad}{c-a}$

b. If the unit price is increased, then the equilibrium quantity decreases while the equilibrium price increases.

c. If the upper bound for the unit price of a commodity is lowered, then both the equilibrium quantity and the equilibrium price drop.

67. 2500; $67.50 69. 11,000; $3 71. 8000; $80

73. $f(x) = 2x + \frac{500}{x}; x > 0$ 75. $f(x) = 0.5x^2 + \frac{8}{x}$

77. $f(x) = (22 + x)(36 - 2x)$ bushels/acre

79. a. $P(x) = (10{,}000 + x)(5 - 0.0002x)$ b. $60,800

81. False 83. False

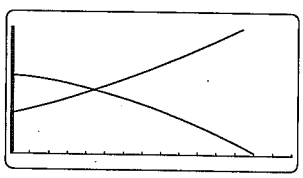
Using Technology Exercises 2.3, page 94

1. (−3.0414, 0.1503); (3.0414, 7.4497)

3. (−2.3371, 2.4117); (6.0514, −2.5015)

5. (−1.0219, −6.3461); (1.2414, −1.5931); (5.7805, 7.9391)

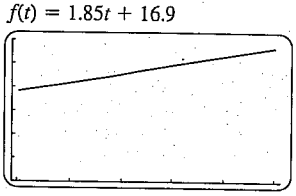
7. a.



b. 438 wall clocks; $40.92

9. a. $f(t) = 1.85t + 16.9$

b.



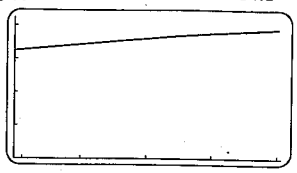
c.

t	1	2	3	4	5	6
y	18.8	20.6	22.5	24.3	26.2	28.0

d. 31.7 gallons

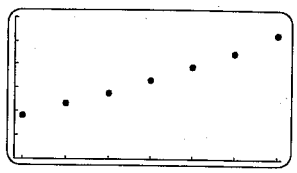
11. a. $f(t) = -0.221t^2 + 4.14t + 64.8$

b.



c. 77.8 million

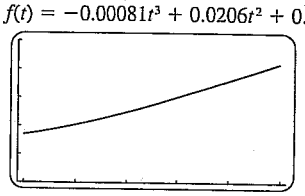
13. a.



b. $f(t) = 2.94t^2 + 38.75t + 188.5$ c. $604 billion

15. a. $f(t) = -0.00081t^3 + 0.0206t^2 + 0.125t + 1.69$

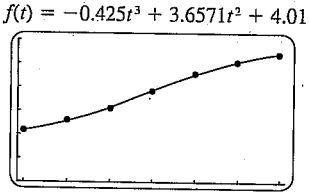
b.



c. $1.8 trillion; $2.7 trillion; $4.2 trillion

17. a. $f(t) = -0.425t^3 + 3.6571t^2 + 4.018t + 43.7$

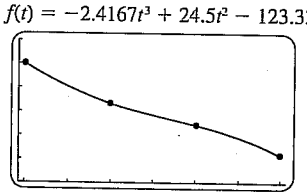
b.



c. $43.7 million; $77.2 million; $107.7 million

19. a. $f(t) = -2.4167t^3 + 24.5t^2 - 123.33t + 506$

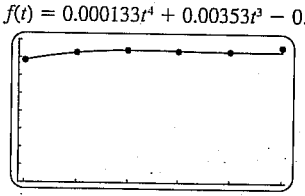
b.



c. 506,000; 338,000; 126,000 d. Approximately 200,000

21. a. $f(t) = 0.000133t^4 + 0.00353t^3 - 0.04487t^2 + 0.143t + 1.71$

b.



c. 1.71 mg; 1.81 mg; 1.85 mg; 1.84 mg; 1.82 mg; 1.83 mg

d. 1.9 mg/cigarette

Exercises 2.4, page 111

1. $\lim_{x \to -2} f(x) = 3$ 3. $\lim_{x \to 3} f(x) = 3$ 5. $\lim_{x \to -2} f(x) = 3$

7. The limit does not exist.

9.

x	1.9	1.99	1.999
$f(x)$	4.61	4.9601	4.9960

x	2.001	2.01	2.1
$f(x)$	5.004	5.0401	5.41

$\lim_{x\to 2}(x^2+1) = 5$

11.

x	−0.1	−0.01	−0.001
$f(x)$	−1	−1	−1

x	0.001	0.01	0.1
$f(x)$	1	1	1

The limit does not exist.

13.

x	0.9	0.99	0.999
$f(x)$	100	10,000	1,000,000

x	1.001	1.01	1.1
$f(x)$	1,000,000	10,000	100

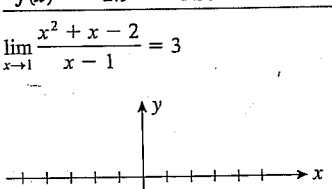
The limit does not exist.

15.

x	0.9	0.99	0.999	1.001	1.01	1.1
$f(x)$	2.9	2.99	2.999	3.001	3.01	3.1

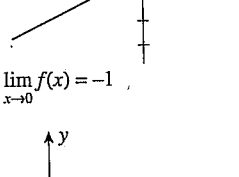
$\lim_{x\to 1}\dfrac{x^2+x-2}{x-1} = 3$

17.



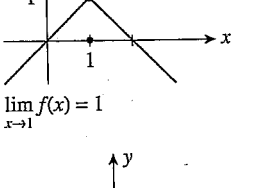
$\lim_{x\to 0} f(x) = -1$

19.



$\lim_{x\to 1} f(x) = 1$

21.



$\lim_{x\to 0} f(x) = 0$

23. 3 25. 3 27. −1 29. 2 31. −4 33. $\frac{5}{4}$

35. 2 37. $\sqrt{171} = 3\sqrt{19}$ 39. $\frac{3}{2}$ 41. −1 43. −6

45. 2 47. $\frac{1}{6}$ 49. 2 51. −1 53. −10

55. The limit does not exist. 57. $\frac{5}{3}$ 59. $\frac{1}{2}$ 61. $\frac{1}{3}$

63. $\lim_{x\to\infty} f(x) = \infty$; $\lim_{x\to-\infty} f(x) = \infty$ 65. 0; 0

67. $\lim_{x\to\infty} f(x) = -\infty$; $\lim_{x\to-\infty} f(x) = -\infty$

69.

x	1	10	100	1000
$f(x)$	0.5	0.009901	0.0001	0.000001

x	−1	−10	−100	−1000
$f(x)$	0.5	0.009901	0.0001	0.000001

$\lim_{x\to\infty} f(x) = 0$ and $\lim_{x\to-\infty} f(x) = 0$

71.

x	1	5	10	100
$f(x)$	12	360	2910	2.99×10^6

x	1000	−1	−5
$f(x)$	2.999×10^9	6	−390

x	−10	−100	−1000
$f(x)$	−3090	-3.01×10^6	-3.0×10^9

$\lim_{x\to\infty} f(x) = \infty$ and $\lim_{x\to-\infty} f(x) = -\infty$

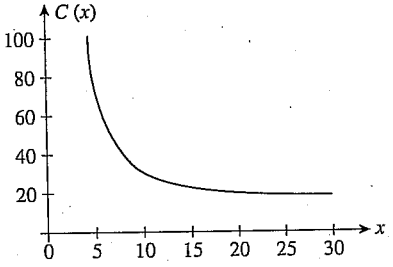
73. 3 75. 3 77. $\lim_{x\to-\infty} f(x) = -\infty$ 79. 0

81. a. \$0.5 million; \$0.75 million; \$1,166,667; \$2 million; \$4.5 million; \$9.5 million
b. The limit does not exist; as the percent of pollutant to be removed approaches 100, the cost becomes astronomical.

83. \$2.20; the average cost of producing x DVDs will approach \$2.20/disc in the long run.

85. a. \$24 million; \$60 million; \$83.1 million b. \$120 million

87. a. 76.1¢/mi; 30.5¢/mi; 23¢/mi; 20.6¢/mi; 19.5¢/mi
b.



c. It approaches 17.8¢/mi.

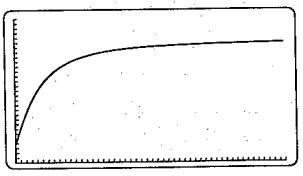
89. False 91. True 93. True

95. a moles/liter/second 97. No

Using Technology Exercises 2.4, page 117

1. 5 3. 3 5. $\frac{2}{3}$ 7. e^2

11. a.



b. 25,000