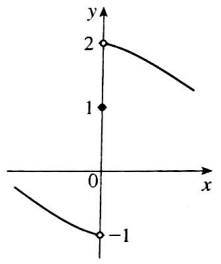
**63.** (a) $f(x) = x^2 + 6$ (b) $g(x) = x^2 + x - 1$
**65.** Yes

## EXERCISES 1.4 ■ PAGE 49

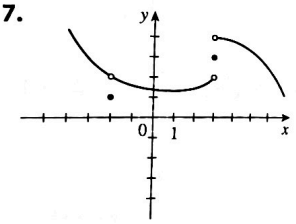
**1.** (a) $-44.4, -38.8, -27.8, -22.2, -16.\overline{6}$
(b) $-33.3$ (c) $-33\frac{1}{3}$
**3.** (a) (i) 2 (ii) 1.111111 (iii) 1.010101 (iv) 1.001001
(v) 0.666667 (vi) 0.909091 (vii) 0.990099
(viii) 0.999001 (b) 1 (c) $y = x - 3$
**5.** (a) (i) $-32$ ft/s (ii) $-25.6$ ft/s (iii) $-24.8$ ft/s
(iv) $-24.16$ ft/s (b) $-24$ ft/s
**7.** (a) (i) 29.3 ft/s (ii) 32.7 ft/s (iii) 45.6 ft/s
(iv) 48.75 ft/s (b) 29.7 ft/s
**9.** (a) 0, 1.7321, $-1.0847$, $-2.7433$, 4.3301, $-2.8173$, 0,
$-2.1651$, $-2.6061$, $-5$, 3.4202; no (c) $-31.4$

## EXERCISES 1.5 ■ PAGE 59

**1.** Yes
**3.** (a) $\lim_{x \to -3} f(x) = \infty$ means that the values of $f(x)$ can be made arbitrarily large (as large as we please) by taking $x$ sufficiently close to $-3$ (but not equal to $-3$).
(b) $\lim_{x \to 4^+} f(x) = -\infty$ means that the values of $f(x)$ can be made arbitrarily large negative by taking $x$ sufficiently close to 4 through values larger than 4.
**5.** (a) 2 (b) 1 (c) 4 (d) Does not exist (e) 3
**7.** (a) $-1$ (b) $-2$ (c) Does not exist (d) 2 (e) 0
(f) Does not exist (g) 1 (h) 3
**9.** (a) $-\infty$ (b) $\infty$ (c) $\infty$ (d) $-\infty$ (e) $\infty$
(f) $x = -7, x = -3, x = 0, x = 6$
**11.** $\lim_{x \to a} f(x)$ exists for all $a$ except $a = -1$.
**13.** (a) 1 (b) 0 (c) Does not exist
**15.**



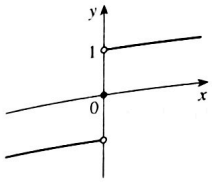

**17.**




**19.** $\frac{1}{2}$ **21.** $\frac{1}{2}$ **23.** 1.5 **25.** 1 **27.** (a) $-1.5$
**29.** $\infty$ **31.** $\infty$ **33.** $-\infty$ **35.** $-\infty$ **37.** $-\infty$
**39.** $\infty$ **41.** $-\infty$; $\infty$
**43.** (a) 0.998000, 0.638259, 0.358484, 0.158680, 0.038851, 0.008928, 0.001465; 0
(b) 0.000572, $-0.000614$, $-0.000907$, $-0.000978$, $-0.000993$, $-0.001000$; $-0.001$
**45.** No matter how many times we zoom in toward the origin, the graph appears to consist of almost-vertical lines. This indicates more and more frequent oscillations as $x \to 0$.
**47.** $x \approx \pm 0.90, \pm 2.24$; $x = \pm \sin^{-1}(\pi/4), \pm(\pi - \sin^{-1}(\pi/4))$
**49.** (a) 6 (b) Within 0.0649 of 1

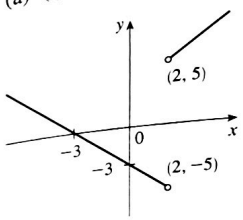
## EXERCISES 1.6 ■ PAGE 70

**1.** (a) $-6$ (b) $-8$ (c) 2 (d) $-6$
(e) Does not exist (f) 0
**3.** 105 **5.** $\frac{7}{8}$ **7.** 390 **9.** $\frac{3}{2}$ **11.** 4
**13.** Does not exist **15.** $\frac{6}{5}$ **17.** $-10$ **19.** $\frac{1}{12}$
**21.** $\frac{1}{6}$ **23.** $-\frac{1}{9}$ **25.** 1 **27.** $\frac{1}{128}$ **29.** $-\frac{1}{2}$
**31.** $3x^2$ **33.** (a), (b) $\frac{2}{3}$ **37.** 7 **41.** 6 **43.** $-4$
**45.** Does not exist
**47.** (a)




(b) (i) 1
(ii) $-1$
(iii) Does not exist
(iv) 1

**49.** (a) (i) 5 (ii) $-5$ (b) Does not exist
(c)




**51.** 7
**53.** (a) (i) $-2$ (ii) Does not exist (iii) $-3$
(b) (i) $n - 1$ (ii) $n$ (c) $a$ is not an integer.
**59.** 8 **65.** 15; $-1$

## EXERCISES 1.7 ■ PAGE 81

**1.** 0.1 (or any smaller positive number)
**3.** 1.44 (or any smaller positive number)
**5.** 0.0906 (or any smaller positive number)
**7.** 0.0219 (or any smaller positive number);
0.011 (or any smaller positive number)
**9.** (a) 0.041 (or any smaller positive number)
(b) $\lim_{x \to 4^+} \dfrac{x^2 + 4}{\sqrt{x - 4}} = \infty$
**11.** (a) $\sqrt{1000/\pi}$ cm (b) Within approximately 0.0445 cm
(c) Radius; area; $\sqrt{1000/\pi}$; 1000; 5; $\approx 0.0445$
**13.** (a) 0.025 (b) 0.0025
**35.** (a) 0.093 (b) $\delta = (B^{2/3} - 12)/(6B^{1/3}) - 1$, where
$B = 216 + 108\varepsilon + 12\sqrt{336 + 324\varepsilon + 81\varepsilon^2}$
**41.** Within 0.1

## EXERCISES 1.8 ■ PAGE 91

**1.** $\lim_{x \to 4} f(x) = f(4)$
**3.** (a) $-4, -2, 2, 4$; $f(-4)$ is not defined and $\lim_{x \to a} f(x)$ does not exist for $a = -2, 2$, and 4
(b) $-4$, neither; $-2$, left; 2, right; 4, right