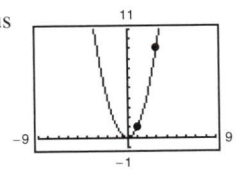
Review Exercises for Chapter 1 (page 91)

1. Calculus



Estimate: 8.3

3.

x	-0.1	-0.01	-0.001
$f(x)$	-1.0526	-1.0050	-1.0005

x	0.001	0.01	0.1
$f(x)$	-0.9995	-0.9950	-0.9524

The estimate of the limit of $f(x)$, as x approaches zero, is -1.00.

5. 5; Proof **7.** -3; Proof **9.** (a) 4 (b) 5 **11.** 16

13. $\sqrt{6} \approx 2.45$ **15.** $-\frac{1}{4}$ **17.** $\frac{1}{2}$ **19.** -1 **21.** 75

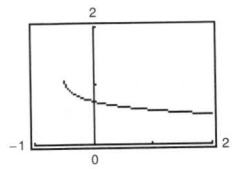
23. 0 **25.** $\sqrt{3}/2$ **27.** $-\frac{1}{2}$ **29.** $\frac{7}{12}$

31. (a)

x	1.1	1.01	1.001	1.0001
$f(x)$	0.5680	0.5764	0.5773	0.5773

$\lim_{x \to 1^+} f(x) \approx 0.5773$

(b)



The graph has a hole at $x = 1$.

$\lim_{x \to 1^+} f(x) \approx 0.5774$

(c) $\sqrt{3}/3$

33. -39.2 m/sec **35.** -1 **37.** 0

39. Limit does not exist. The limit as t approaches 1 from the left is 2 whereas the limit as t approaches 1 from the right is 1.

41. Continuous for all real x

43. Nonremovable discontinuity at each integer
Continuous on $(k, k + 1)$ for all integers k

45. Removable discontinuity at $x = 1$
Continuous on $(-\infty, 1) \cup (1, \infty)$

47. Nonremovable discontinuity at $x = 2$
Continuous on $(-\infty, 2) \cup (2, \infty)$

49. Nonremovable discontinuity at $x = -1$
Continuous on $(-\infty, -1) \cup (-1, \infty)$

51. Nonremovable discontinuity at each even integer
Continuous on $(2k, 2k + 2)$ for all integers k

53. $c = -\frac{1}{2}$ **55.** Proof

57. (a) -4 (b) 4 (c) Limit does not exist.

59. $x = 0$ **61.** $x = 10$ **63.** $-\infty$ **65.** $\frac{1}{3}$

67. $-\infty$ **69.** $-\infty$ **71.** $\frac{4}{5}$ **73.** ∞

75. (a) \$14,117.65 (b) \$80,000.00 (c) \$720,000.00 (d) ∞

P.S. Problem Solving (page 93)

1. (a) Perimeter $\triangle PAO = 1 + \sqrt{(x^2 - 1)^2 + x^2} + \sqrt{x^4 + x^2}$

Perimeter $\triangle PBO = 1 + \sqrt{x^4 + (x - 1)^2} + \sqrt{x^4 + x^2}$

(b)

x	4	2	1
Perimeter $\triangle PAO$	33.0166	9.0777	3.4142
Perimeter $\triangle PBO$	33.7712	9.5952	3.4142
$r(x)$	0.9777	0.9461	1.0000

x	0.1	0.01
Perimeter $\triangle PAO$	2.0955	2.0100
Perimeter $\triangle PBO$	2.0006	2.0000
$r(x)$	1.0475	1.0050

(c) 1

3. (a) Area (hexagon) $= (3\sqrt{3})/2 \approx 2.5981$

Area (circle) $= \pi \approx 3.1416$

Area (circle) $-$ Area (hexagon) ≈ 0.5435

(b) $A_n = (n/2)\sin(2\pi/n)$

(c)

n	6	12	24	48	96
A_n	2.5981	3.0000	3.1058	3.1326	3.1394

(d) 3.1416 or π

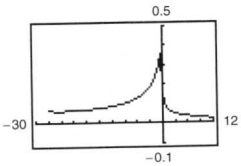
5. (a) $m = -\frac{12}{5}$ (b) $y = \frac{5}{12}x - \frac{169}{12}$

(c) $m_x = \dfrac{-\sqrt{169 - x^2} + 12}{x - 5}$

(d) $\frac{5}{12}$; It is the same as the slope of the tangent line found in (b).

7. (a) Domain: $[-27, 1) \cup (1, \infty)$

(b)

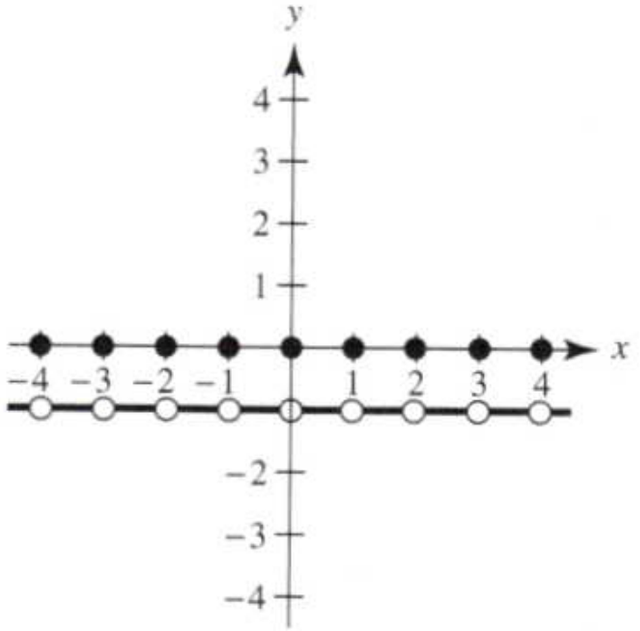


(c) $\frac{1}{14}$ (d) $\frac{1}{12}$

The graph has a hole at $x = 1$.

9. (a) g_1, g_4 (b) g_1 (c) g_1, g_3, g_4

11.



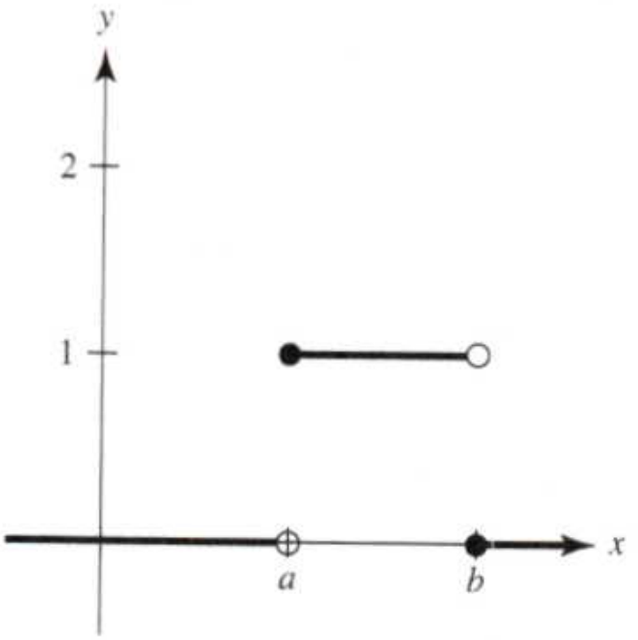
The graph jumps at every integer.

(a) $f(1) = 0,\ f(0) = 0,\ f\left(\frac{1}{2}\right) = -1,\ f(-2.7) = -1$

(b) $\lim_{x \to 1^-} f(x) = -1,\ \lim_{x \to 1^+} f(x) = -1,\ \lim_{x \to 1/2} f(x) = -1$

(c) There is a discontinuity at each integer.

13. (a)



(b) (i) $\lim_{x \to a^+} P_{a,b}(x) = 1$

(ii) $\lim_{x \to a^-} P_{a,b}(x) = 0$

(iii) $\lim_{x \to b^+} P_{a,b}(x) = 0$

(iv) $\lim_{x \to b^-} P_{a,b}(x) = 1$

(c) Continuous for all positive real numbers except a and b

(d) The area under the graph of U and above the x-axis is 1.