Since \( \lim_{\Delta x} \), \( \Delta t \) for \( 3e \).

\( b) \lim_{t \to 0} f(t) = \lim_{t \to 0} g(t) = \lim_{t \to 0} \text{Dom}(f(t)) = \lim_{t \to 0} \text{Dom}(g(t)) = \lim_{t \to 0} \{x : \sin(x) > 0\} = 0 \cdot \ldots \cdot \cup \{2\pi, 3\pi, 4\pi, \ldots\} = \cup_{n \in \mathbb{Z}} [2n\pi, 2(n+1)\pi]. \)

56. With \( v = 350 \text{mi/h} \) and \( h = \text{lim}_{t \to 0} \), \( d = v \cdot t = d(t); s = \sqrt{h^2 + d^2} = s(d); s(t) = s \circ d(t) = \sqrt{h^2 + \epsilon^2 + t^2}. \)

60. \( A^{(n)}(x) = \) notation for composing \( n \) times = \( A \circ A \circ \ldots \circ A(x) = (1.04)^n \).

Although \( c = 1.04 \) is very near 1, at one point the powers of \( c \) will get very large. Example: \( c^{20} \approx 2.19, c^{70} \approx 7.1, c^{100} \approx 50.5, c^{200} \approx 2550.7, c^{400} \approx 6,506,324 \).

61. a) \( h(x) = 4x^2 + 4x + 1 = (2x + 1)^2 + 2 = g(x)^2 + 2, \) so \( f(x) = x^2 + 1. \)

Section 1.3

3. c) \( \lim_{x \to 1} f(x) = 2, \lim_{x \to 1} f(x) = 3, \) so \( \lim_{x \to 1} f(x) \) does not exist.

11. If \( x = \epsilon \) is a point near 2 (with \( \epsilon \approx 0 \)), then \( \frac{x^2 - 2x}{x^2 - 2} = \frac{2\epsilon + \epsilon^2}{3\epsilon + \epsilon^2} = \frac{2 + \epsilon}{3 + \epsilon} \approx \frac{2}{3}. \)

(This is not the complete answer to this exercise.)

Section 1.4

2. b) \( \lim_{x \to 1} [f(x) + g(x)] = \lim_{x \to 1} f(x) + \lim_{x \to 1} g(x) = 1 + 1 = 3. \)

Since \( \lim_{x \to 1} f(x) \neq \lim_{x \to 1} f(x) + \lim_{x \to 1} g(x) \) does not exist.

4. \( \lim_{t \to 1} (t^2 + 1)^5 = [\lim_{t \to 1} (t^2 + 1)]^5 \cdot [\lim_{t \to 1} (t + 3)]^5. \)

Since \( \lim_{t \to 1} (t^2 + 1) = \lim_{t \to 1} t^2 + 1 = 1 + 1 = 2, \)

\( \lim_{t \to 1} t + 3 = \lim_{t \to 1} t + \lim_{t \to 1} 3 = -1 + 3 = 2, \)

the answer is \( 2^5 \cdot 5^5 = 2^5 = 256. \)

10. a) The identity holds only for \( x \neq 2 \) [the left-hand side doesn’t make sense at \( x = 2 \)].

b) The equation is correct since the expression \( \lim_{x \to 2} \) means that \( x \) approaches 2 \( \text{without equalling} \) 2.

21. \( \sqrt{x^2 - 2} - 3 = (x + 2) - 3 = \frac{x - 7}{\sqrt{x^2 + 2} + 3} \); hence

\[ \frac{x - 7}{\sqrt{x^2 + 2} + 3} = \frac{1}{\sqrt{x^2 + 2} + 3} \] (this holds for \( x \neq 7). \)

\[ \lim_{x \to 7} \frac{x - 7}{\sqrt{x^2 + 2} + 3} = \lim_{x \to 7} \frac{1}{\sqrt{x^2 + 2} + 3} = \frac{1}{\sqrt{7^2 + 2} + 3} = \frac{1}{6}. \]

24. We first simplify the expression: for \( t \neq 0, \)

\[ 1 - \frac{1}{t^2 + 1} = \frac{t^2 - 1}{t(t^2 + 1)} = \frac{t^2}{t(t^2 + 1)} = \frac{t}{t^2 + 1}. \]

\[ \lim_{t \to 0} \frac{1}{t^2 + 1} = \lim_{t \to 0} \frac{t}{t^2 + 1} = \frac{\lim_{t \to 0} t}{\lim_{t \to 0} t^2 + 1} = 0 = 0. \]

32. For \( x > 0, \) \( \sqrt{x} \leq \sqrt{x \cdot [1 + \sin^2(2\pi/x)]} \leq 2\sqrt{x}. \)

Since \( \lim_{x \to 0^+} \sqrt{x} = \lim_{x \to 0^+} 2\sqrt{x} = 0, \) we can apply the squeeze theorem.