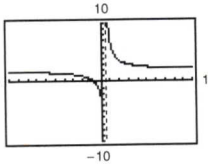
Section 3.5 (page 205)

1. f **2.** c **3.** d **4.** a **5.** b **6.** e

7.

x	10^0	10^1	10^2	10^3
$f(x)$	7	2.2632	2.0251	2.0025

x	10^4	10^5	10^6
$f(x)$	2.0003	2.0000	2.0000

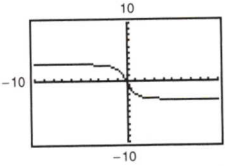


$$\lim_{x\to\infty} \frac{4x + 3}{2x - 1} = 2$$

9.

x	10^0	10^1	10^2	10^3
$f(x)$	-2	-2.9814	-2.9998	-3.0000

x	10^4	10^5	10^6
$f(x)$	-3.0000	-3.0000	-3.0000

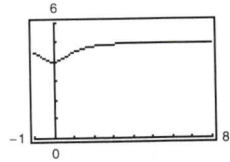


$$\lim_{x\to\infty} \frac{-6x}{\sqrt{4x^2 + 5}} = -3$$

11.

x	10^0	10^1	10^2	10^3
$f(x)$	4.5000	4.9901	4.9999	5.0000

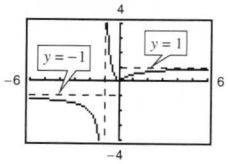
x	10^4	10^5	10^6
$f(x)$	5.0000	5.0000	5.0000



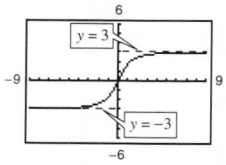
$$\lim_{x\to\infty} \left(5 - \frac{1}{x^2 + 1}\right) = 5$$

13. (a) ∞ (b) 5 (c) 0 **15.** (a) 0 (b) 1 (c) ∞
17. (a) 0 (b) $-\frac{2}{3}$ (c) $-\infty$ **19.** 4 **21.** $\frac{2}{3}$ **23.** 0
25. $-\infty$ **27.** -1 **29.** -2 **31.** $\frac{1}{2}$ **33.** ∞
35. 0 **37.** 0

39.



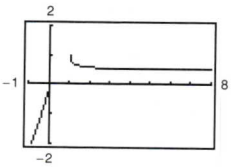
41.



43. 1 **45.** 0 **47.** $\frac{1}{6}$

49.

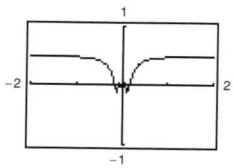
x	10^0	10^1	10^2	10^3	10^4	10^5	10^6
$f(x)$	1.000	0.513	0.501	0.500	0.500	0.500	0.500



$$\lim_{x\to\infty}\left[x - \sqrt{x(x-1)}\right] = \frac{1}{2}$$

51.

x	10^0	10^1	10^2	10^3	10^4	10^5	10^6
$f(x)$	0.479	0.500	0.500	0.500	0.500	0.500	0.500

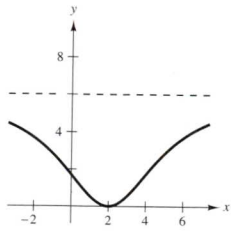


The graph has a hole at $x = 0$.

$$\lim_{x\to\infty} x \sin\frac{1}{2x} = \frac{1}{2}$$

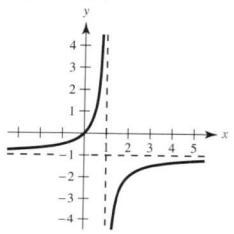
53. As x becomes large, $f(x)$ approaches 4.

55. Answers will vary. Example: let $f(x) = \dfrac{-6}{0.1(x-2)^2 + 1} + 6$.

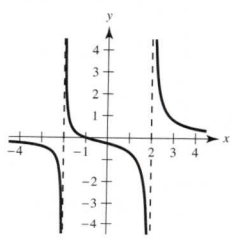


57. (a) 5 (b) -5

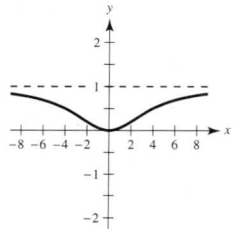
59.



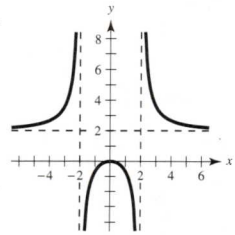
61.



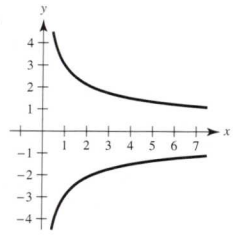
63.



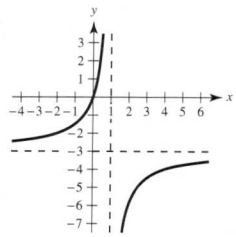
65.



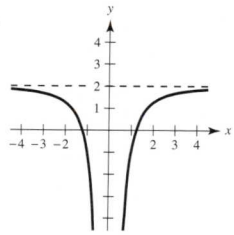
67.



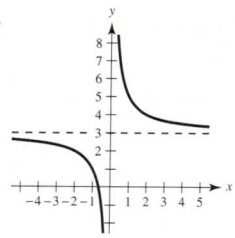
69.



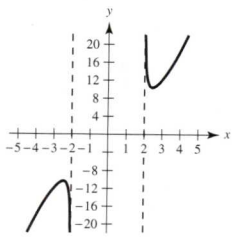
71.



73.



75.



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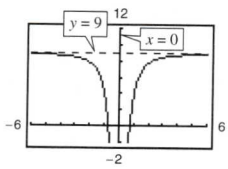
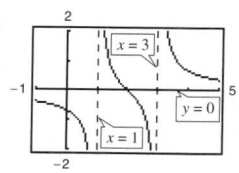
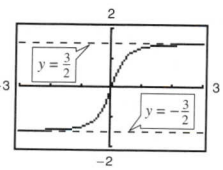


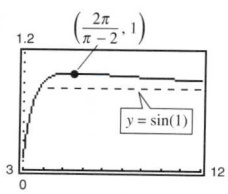
79.



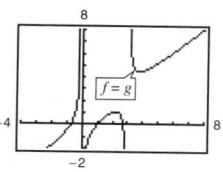
81.



83.

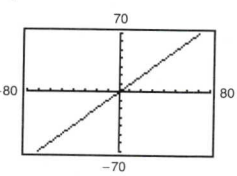


85. (a)



(b) Proof

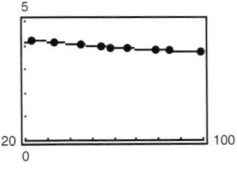
(c)



The slant asymptote $y = x$

87. 100% **89.** $\lim_{t\to\infty} N(t) = +\infty$; $\lim_{t\to\infty} E(t) = c$

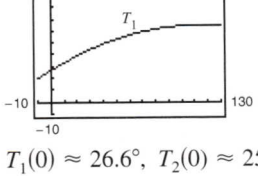
91. (a)



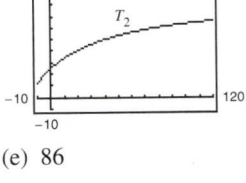
(b) Yes. $\lim_{t \to \infty} y = 3.351$

93. (a) $T_1 = -0.003t^2 + 0.68t + 26.6$

(b)



(c)

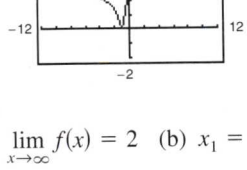


(d) $T_1(0) \approx 26.6°$, $T_2(0) \approx 25.0°$ (e) 86

(f) The limiting temperature is 86°.
No. T_1 has no horizontal asymptote.

95. (a) $d(m) = \dfrac{|3m + 3|}{\sqrt{m^2 + 1}}$

(b)



(c) $\lim_{m \to \infty} d(m) = 3$

$\lim_{m \to -\infty} d(m) = 3$

As m approaches $\pm\infty$, the distance approaches 3.

97. (a) $\lim_{x \to \infty} f(x) = 2$ (b) $x_1 = \sqrt{\dfrac{4 - 2\varepsilon}{\varepsilon}}$, $x_2 = -\sqrt{\dfrac{4 - 2\varepsilon}{\varepsilon}}$

(c) $\sqrt{\dfrac{4 - 2\varepsilon}{\varepsilon}}$ (d) $-\sqrt{\dfrac{4 - 2\varepsilon}{\varepsilon}}$

99. (a) Answers will vary. $M = \dfrac{5\sqrt{33}}{11}$

(b) Answers will vary. $M = \dfrac{29\sqrt{177}}{59}$

101–105. Proofs

107. False. Let $f(x) = \dfrac{2x}{\sqrt{x^2 + 2}}$. $f'(x) > 0$ for all real numbers.