Calculus and Analytical Geometry

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Limit of a Function

4. For the function f whose graph is given, state the value of each quantity, if it exists. If it does not exist, explain why.
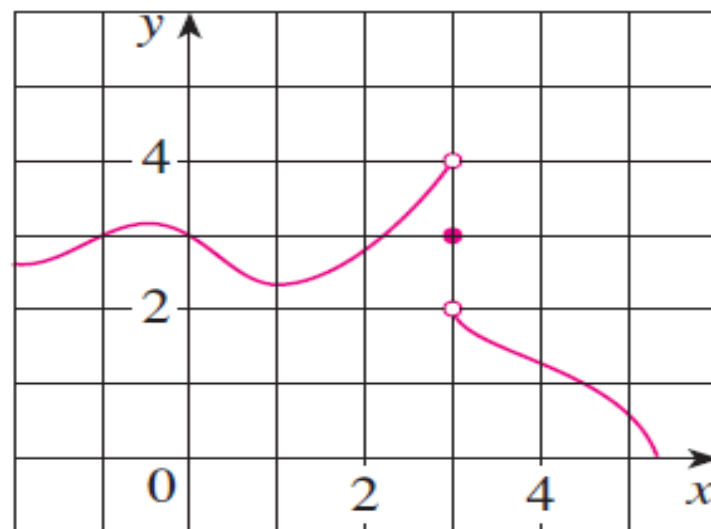
(a) $\lim_{x \to 0} f(x)$ (b) $\lim_{x \to 3^-} f(x)$ (c) $\lim_{x \to 3^+} f(x)$

(d) $\lim_{x \to 3} f(x)$ (e) $f(3)$

5. Use the given graph of f to state the value of each quantity, if it exists. If it does not exist, explain why.
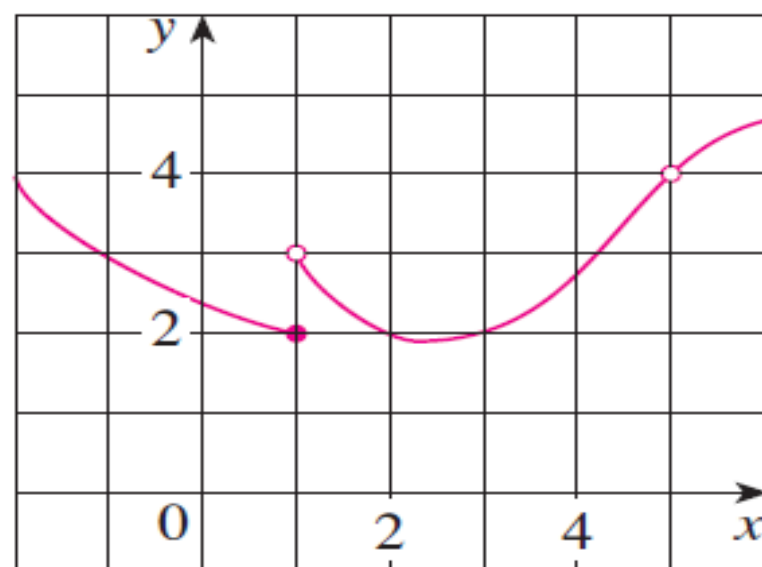
(a) $\lim\limits_{x \to 1^-} f(x)$ (b) $\lim\limits_{x \to 1^+} f(x)$ (c) $\lim\limits_{x \to 1} f(x)$
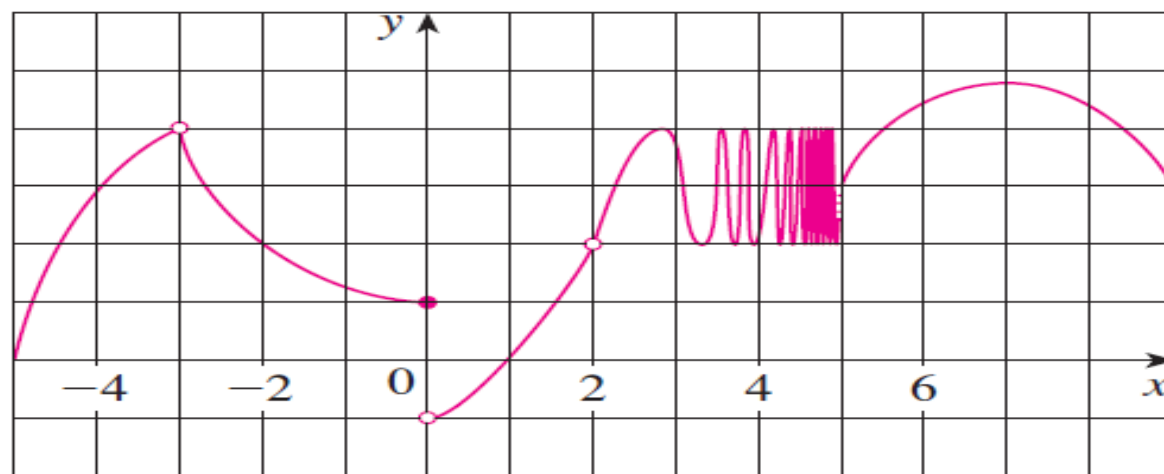
(d) $\lim\limits_{x \to 5} f(x)$ (e) $f(5)$

6. For the function h whose graph is given, state the value of each quantity, if it exists. If it does not exist, explain why.

(a) $\lim\limits_{x \to -3^-} h(x)$

(b) $\lim\limits_{x \to -3^+} h(x)$

(c) $\lim\limits_{x \to -3} h(x)$

(d) $h(-3)$

(e) $\lim\limits_{x \to 0^-} h(x)$

(f) $\lim\limits_{x \to 0^+} h(x)$

(g) $\lim\limits_{x \to 0} h(x)$

(h) $h(0)$

(i) $\lim\limits_{x \to 2} h(x)$

(j) $h(2)$

(k) $\lim\limits_{x \to 5^+} h(x)$

(l) $\lim\limits_{x \to 5^-} h(x)$

7. For the function g whose graph is given, state the value of each quantity, if it exists. If it does not exist, explain why.

(a) $\lim\limits_{t \to 0^-} g(t)$

(b) $\lim\limits_{t \to 0^+} g(t)$

(c) $\lim\limits_{t \to 0} g(t)$

(d) $\lim\limits_{t \to 2^-} g(t)$

(e) $\lim\limits_{t \to 2^+} g(t)$

(f) $\lim\limits_{t \to 2} g(t)$

(g) $g(2)$

(h) $\lim\limits_{t \to 4} g(t)$
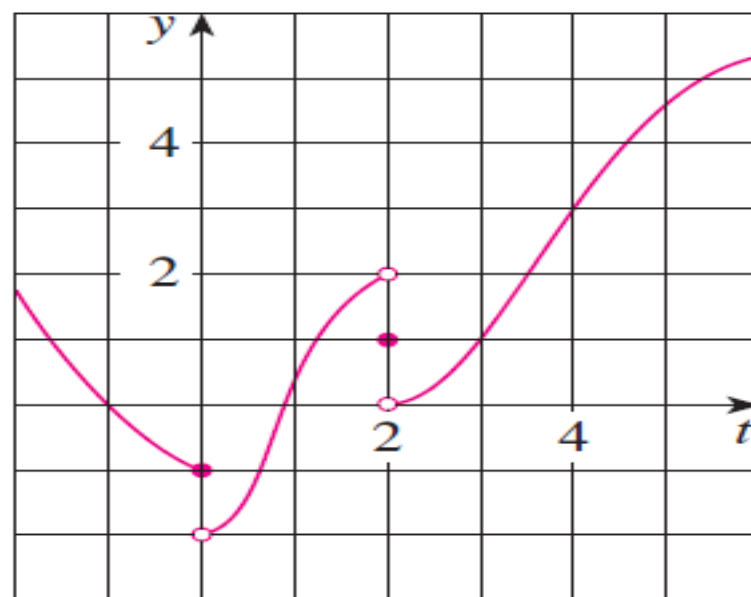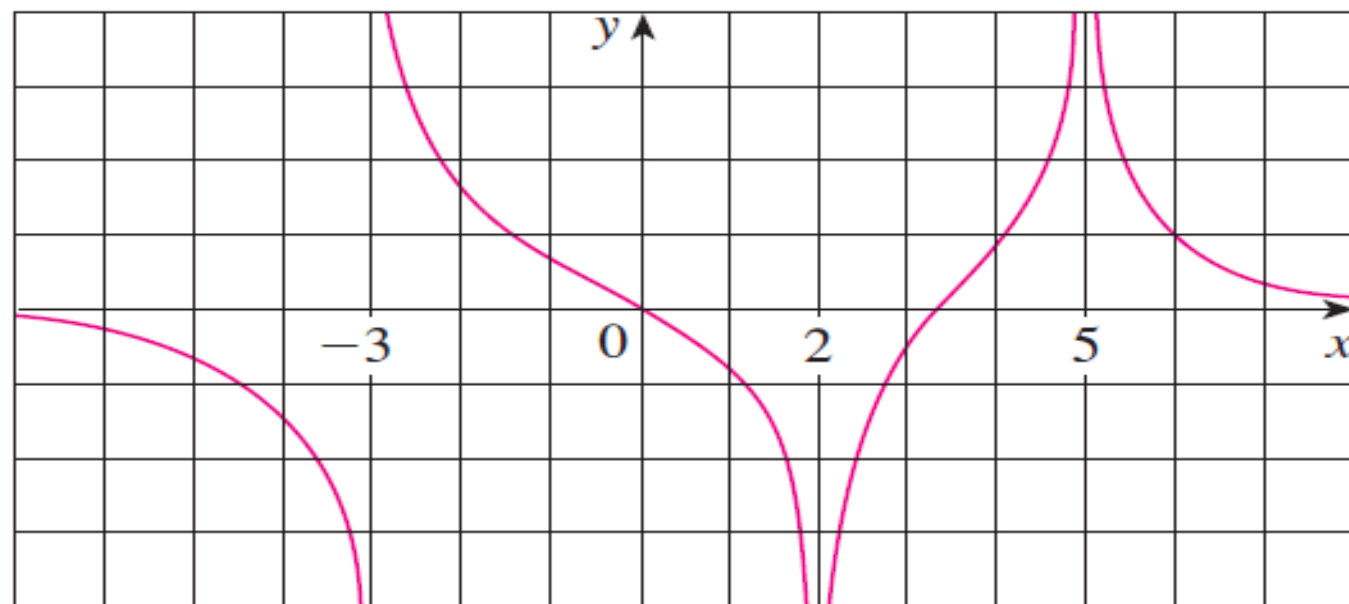
8. For the function R whose graph is shown, state the following.

(a) $\lim_{x \to 2} R(x)$

(b) $\lim_{x \to 5} R(x)$

(c) $\lim_{x \to -3^-} R(x)$

(d) $\lim_{x \to -3^+} R(x)$

(e) The equations of the vertical asymptotes.

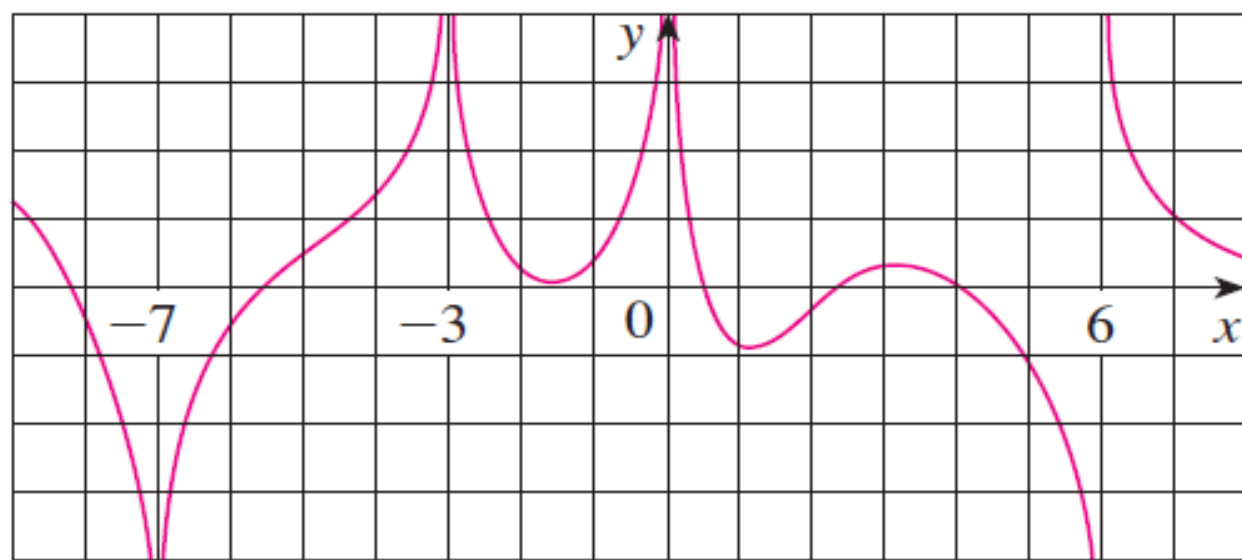**9.** For the function f whose graph is shown, state the following.

(a) $\lim\limits_{x \to -7} f(x)$ (b) $\lim\limits_{x \to -3} f(x)$ (c) $\lim\limits_{x \to 0} f(x)$

(d) $\lim\limits_{x \to 6^-} f(x)$ (e) $\lim\limits_{x \to 6^+} f(x)$

(f) The equations of the vertical asymptotes.

21–24 Use a table of values to estimate the value of the limit. If you have a graphing device, use it to confirm your result graphically.

21. $\lim\limits_{x \to 0} \dfrac{\sqrt{x + 4} - 2}{x}$

22. $\lim\limits_{x \to 0} \dfrac{\tan 3x}{\tan 5x}$

23. $\lim\limits_{x \to 1} \dfrac{x^6 - 1}{x^{10} - 1}$

24. $\lim\limits_{x \to 0} \dfrac{9^x - 5^x}{x}$