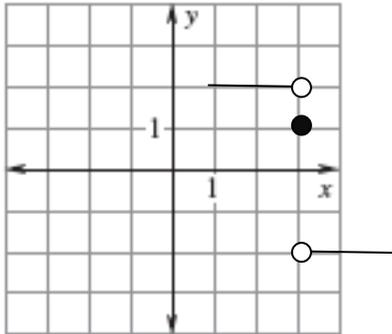


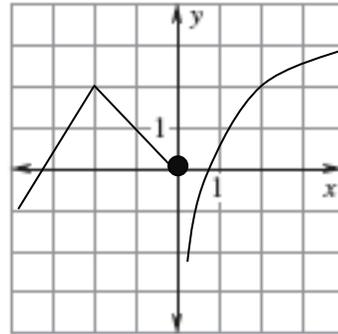
Use the graph to estimate the limits and function values, or explain why the limits do not exist or the function values are undefined.

1.



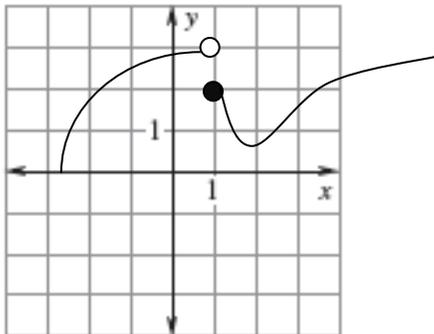
- a.  $\lim_{x \rightarrow 3^-} =$  \_\_\_\_\_
- b.  $\lim_{x \rightarrow 3^+} =$  \_\_\_\_\_
- c.  $\lim_{x \rightarrow 3} =$  \_\_\_\_\_
- d.  $f(3) =$  \_\_\_\_\_

2.



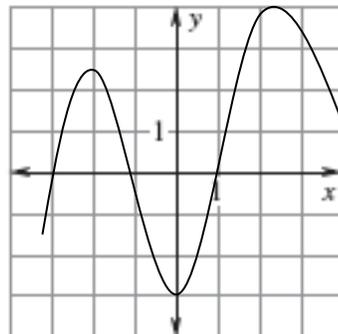
- a.  $\lim_{x \rightarrow -2^-} =$  \_\_\_\_\_
- b.  $\lim_{x \rightarrow -2^+} =$  \_\_\_\_\_
- c.  $\lim_{x \rightarrow -2} =$  \_\_\_\_\_
- d.  $f(-2) =$  \_\_\_\_\_

3.



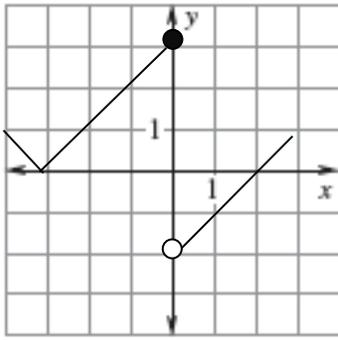
- a.  $\lim_{x \rightarrow 1^-} =$  \_\_\_\_\_
- b.  $\lim_{x \rightarrow 1^+} =$  \_\_\_\_\_
- c.  $\lim_{x \rightarrow 1} =$  \_\_\_\_\_
- d.  $f(1) =$  \_\_\_\_\_

4.



- b.  $\lim_{x \rightarrow 0^-} =$  \_\_\_\_\_
- c.  $\lim_{x \rightarrow 0^+} =$  \_\_\_\_\_
- d.  $\lim_{x \rightarrow 0} =$  \_\_\_\_\_
- e.  $f(0) =$  \_\_\_\_\_

5.



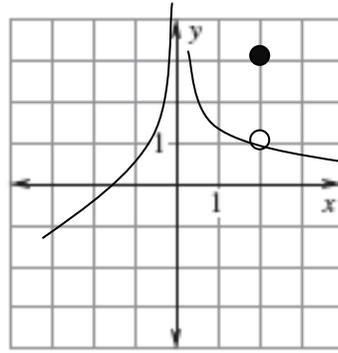
a.  $\lim_{x \rightarrow 0^-} =$  \_\_\_\_\_

b.  $\lim_{x \rightarrow 0^+} =$  \_\_\_\_\_

c.  $\lim_{x \rightarrow 0} =$  \_\_\_\_\_

d.  $f(0) =$  \_\_\_\_\_

6.



a.  $\lim_{x \rightarrow 2^-} =$  \_\_\_\_\_

b.  $\lim_{x \rightarrow 2^+} =$  \_\_\_\_\_

c.  $\lim_{x \rightarrow 2} =$  \_\_\_\_\_

d.  $f(2) =$  \_\_\_\_\_

**Determine the limit.**

7.  $\lim_{x \rightarrow -\frac{1}{2}} 3x^2(2x - 1)$

8.  $\lim_{x \rightarrow -4} (x + 3)^{1997}$

9.  $\lim_{x \rightarrow -3} \frac{x^2 + 4x + 3}{x^2 - 3}$

10.  $\lim_{x \rightarrow 0} e^x \cos x$

11.  $\lim_{x \rightarrow -2} \sqrt{x - 2}$

12.  $\lim_{x \rightarrow 0} \frac{1}{x^2}$

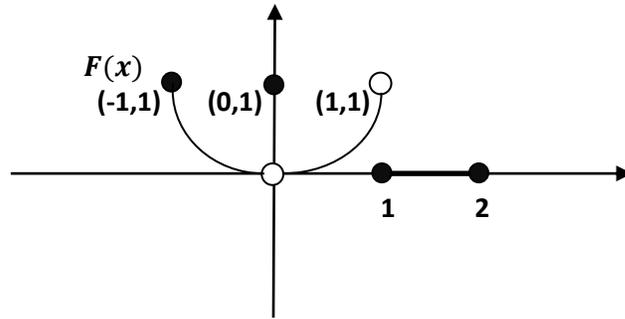
13.  $\lim_{x \rightarrow 1} \frac{x - 1}{x^2 - 1}$

14.  $\lim_{x \rightarrow 2} \frac{x^2 - 3x + 2}{x^2 - 4}$

15.  $\lim_{x \rightarrow 0} \frac{(2 + x)^3 - 8}{x}$

16.  $\lim_{x \rightarrow 0} \frac{\sin 2x}{x}$  \*hint: graph this one!

17.



- a.  $\lim_{x \rightarrow 0^-} f(x) =$  \_\_\_\_\_
- b.  $\lim_{x \rightarrow 0^+} f(x) =$  \_\_\_\_\_
- c.  $\lim_{x \rightarrow 0} f(x) =$  \_\_\_\_\_
- d.  $\lim_{x \rightarrow 1^-} f(x) =$  \_\_\_\_\_
- e.  $\lim_{x \rightarrow 1^+} f(x) =$  \_\_\_\_\_
- f.  $\lim_{x \rightarrow 1} f(x) =$  \_\_\_\_\_
- g.  $\lim_{x \rightarrow 2^-} f(x) =$  \_\_\_\_\_
- h.  $\lim_{x \rightarrow 2^+} f(x) =$  \_\_\_\_\_
- i.  $\lim_{x \rightarrow 2} f(x) =$  \_\_\_\_\_
- j.  $f(0) =$  \_\_\_\_\_
- k. On the interval  $[-1, 1]$ ,  $f(x)$  is discontinuous at  $x =$  \_\_\_\_\_

18. Given the piecewise function  $f(x) = \begin{cases} \sin x, & -2\pi \leq x < 0 \\ \cos x, & 0 \leq x \leq 2\pi \end{cases}$

- a. Draw the graph
- b. At what points does **only** the left hand limit exist?
- c. At what point does **only** the right hand limit exist?

