1. Use the following graph of \( f(x) \) to answer the questions below.

(a) Find the limit \( \lim_{x \to 1^+} f(x) \), if it exists.

(b) Find the limit \( \lim_{x \to 1^-} f(x) \), if it exists.

(c) Is \( f(x) \) continuous at \( x = -1 \)?
2. If \( f(x) \) is a function so that
\[
\lim_{x \to 0} f(x) = 5,
\]
what must be true about \( f(x) \)? Circle the letter of the best answer below.

(a) \( f(2) = 5 \)
(b) \( f(x) \) is continuous at \( x = 2 \)
(c) \( f(x) \) is defined at \( x = 2 \)
(d) both (b) and (c)
(e) none of the above

In problems 3-9, evaluate the limits if they exist. If a limit does not exist, explain why not.

3. \( \lim_{x \to 3} -2 \)

4. \( \lim_{x \to 0} \frac{1}{x^2} \)
5. \( \lim_{x \to 2} \frac{\sqrt{x + 2} - 2}{x - 2} \)

6. \( \lim_{x \to 0} \frac{\sqrt{x^3 + 4} - \sqrt{x + 1}}{3x^2 + 1} \)
7. $\lim_{x \to 0} \cos \left( \frac{x}{x + 1} \right)$

8. $\lim_{x \to 1} \frac{x + 1}{x^2 - 1}$

9. $\lim_{x \to 1} \frac{x + 1}{x^2 - 1}$
10. The function $f(x)$ is given by

$$f(x) = \begin{cases} 
  x^2 & \text{if } x \neq 0 \\
  1 & \text{if } x = 0.
\end{cases}$$

Is $f(x)$ continuous at $x = 0$? Explain why/why not using the definition of continuity.
11. Can you think of a specific function \( f(x) \) so that
\[
\lim_{x \to 0^-} f(x) = -\infty \text{ and } \lim_{x \to 0^+} f(x) = \infty.
\]

12. Can you think of a specific function \( f(x) \) that is continuous at every number in its domain, but that
\[
\lim_{x \to 1} f(x) \text{ DNE?}
\]
13. Sketch a graph of a function $f(x)$ so that all of the following are true:

(a) $f(2) = 3$
(b) $\lim_{x \to 2} f(x) \text{DNE}$
(c) both $\lim_{x \to 2^-} f(x)$ and $\lim_{x \to 2^+} f(x)$ exist.