

## One-Sided Limits and Continuity with Piece-Wise Defined Functions

Name \_\_\_\_\_

Period \_\_\_\_\_

Graph the following piece-wise defined functions. Then determine the left and right limits at the indicated values. Also determine if the function is continuous at the indicated value(s). If not, state why.

1. 
$$f(x) = \begin{cases} x, & x \leq 0 \\ x^2, & x > 0 \end{cases}$$

$$\lim_{x \rightarrow 0^-} f(x) =$$
$$\lim_{x \rightarrow 0^+} f(x) =$$
$$\lim_{x \rightarrow 0} f(x) =$$

Is  $f(x)$  continuous at  $x=0$ ? Why or why not?

2. 
$$f(x) = \begin{cases} x-3, & x \leq 1 \\ -x, & x > 1 \end{cases}$$

$$\lim_{x \rightarrow 1^-} f(x) =$$
$$\lim_{x \rightarrow 1^+} f(x) =$$
$$\lim_{x \rightarrow 1} f(x) =$$

Is  $f(x)$  continuous at  $x=1$ ? Why or why not?

3. 
$$f(x) = \begin{cases} x^3 + 1, & x \leq 0 \\ e^x, & x > 0 \end{cases}$$

$$\lim_{x \rightarrow 0^-} f(x) =$$
$$\lim_{x \rightarrow 0^+} f(x) =$$
$$\lim_{x \rightarrow 0} f(x) =$$

Is  $f(x)$  continuous at  $x=0$ ? Why or why not?

4. 
$$f(x) = \begin{cases} |x|, & x \leq 3 \\ \cos x, & x > 3 \end{cases}$$

$$\lim_{x \rightarrow 3^-} f(x) =$$
$$\lim_{x \rightarrow 3^+} f(x) =$$
$$\lim_{x \rightarrow 3} f(x) =$$

Is  $f(x)$  continuous at  $x=3$ ? Why or why not?

$$5. \quad f(x) = \begin{cases} x^2, & x \leq 1 \\ 1, & 1 < x \leq 3 \\ x-2, & x > 3 \end{cases} \quad \begin{array}{l} \lim_{x \rightarrow 1^-} f(x) = \\ \lim_{x \rightarrow 1^+} f(x) = \\ \lim_{x \rightarrow 1} f(x) = \end{array}$$

Is  $f(x)$  continuous at  $x=1$ ? Why or why not?