Calculus 1 Unit 1 worksheet: Continuity on an interval

Name _____ Date _____ Period _____

1. For each function, decide whether it is continuous from the left at the given number, and whether it is continuous from the right. Give the one-sided limits and the value that decide each answer. ($\lfloor x \rfloor$ is the floor function.)

(a) $f(x) = \sqrt[4]{8 - 2x}$ at 4

(b) $p(x) = \sqrt{x}\,\lfloor x \rfloor$ at 4

(c) $r(x) = x^2$ for $x \neq 3$, $r(3) = 1$, at 3

2. Find the largest intervals on which each function is continuous. At each end an interval includes, say which one-sided condition holds there.

(a) $\sqrt{12 - 3x}$

(b) $\ln(x^2 - 4x)$

(c) $\sqrt{x + 3} - \dfrac{1}{x - 1}$

(d) $\dfrac{\sqrt{x}}{\ln x}$

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3. Let $f(x) = \dfrac{\sqrt{9 - x^2}}{x + 1}$. Is f continuous on each interval? Give a reason, and check any one-sided condition the interval needs.

(a) $[0, 3]$ (b) $[-3, 0]$ (c) $[-3, -1)$
(d) $(-1, 3]$

4. Let $g(x) = \lfloor 3 - x \rfloor$, the floor of $3 - x$.

(a) Find $g(2)$, $\lim_{x \to 2^-} g(x)$ and $\lim_{x \to 2^+} g(x)$. Is g continuous from the left at 2? From the right?

(b) On which of $[-1, 0)$, $(-1, 0]$ and $(-1,\ 1)$ is g continuous?

(c) For an integer n, which of $[n, n + 1)$, $(n, n + 1]$ and $[n, n + 1]$ is g continuous on? Explain.

5. Let

$$k(x) = \begin{cases} \sqrt{x + 4} & -4 \le x < 0 \\ 2 - x^2 & 0 \le x \le 2 \\ x - 5 & 2 < x \le 6 \end{cases}$$

(a) Is k continuous on $[-4, 2]$? Check every condition the definition asks for.

(b) Is k continuous on $[2, 6]$?

(c) Find the largest intervals inside $[-4, 6]$ on which k is continuous.

6. Let $s(x) = \sqrt{\cos x}$ (radians).

(a) Use the composition result to show that s is continuous on $\left[-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right]$.

(b) Is s continuous on $[0, \pi]$? Explain.

(c) Use continuity to find $\lim_{x \to \pi/3} s(x)$.

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