1.11 Defining Continuity at a Point

Calculus Name: _____ **CA #1**

State whether the function is continuous at the given x values. Justify your answers!

1. $f(x) = \begin{cases} 2^x + 1, & x \le -1 \\ 2 + \frac{x}{2}, & -1 < x \le 4 \\ x^2 - 3x, & x > 4 \end{cases}$

Continuous at $x = -1$?

Continuous at $x = 4$?

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2. $g(x) = \begin{cases} x^2 + 3x - 7, & x < -3 \\ 2x - 1, & -3 \le x < 1 \\ \ln x, & x \ge 1 \end{cases}$

Continuous at $x = -3$?

Continuous at $x = 1$?

For each function identify the type of each discontinuities and where they are is located.

3. $h(x) = \begin{cases} 4^x, & x < -1 \\ 2, & x = -1 \\ -\frac{x}{4}, & -1 < x \le 4 \\ \sqrt{x} & x > 4 \end{cases}$

4. $f(x) = \begin{cases} \cos\left(\frac{x}{3}\right), & x < \pi \\ \frac{\sqrt{2}}{2}, & x = \pi \\ \sin(x), & \pi < x < \frac{\pi}{2} \\ \sin\left(\frac{x}{2}\right) & x \ge \frac{\pi}{2} \end{cases}$

For each function find the value k that makes the function continuous.

5. $g(x) = \begin{cases} x^2 + 6, & x \le 2 \\ \frac{x}{3} + k, & x > 2 \end{cases}$

6. $h(x) = \begin{cases} (k - x)(k + 1), & x \le -1 \\ -13x - 2k, & x > -1 \end{cases}$

Answers to 1.11 CA #1

1. Cont. at $x = -1$ b/c $f(-1) = \frac{3}{2}$ and $\lim_{x \to -1} f(x) = f(-1)$. Cont. at $x = 4$ b/c $f(4) = 4$ and $\lim_{x \to 4} f(x) = f(4)$.	2. Cont. at $x = -3$ b/c $g(-3) = -7$ and $\lim_{x \to -3} g(x) = g(-3)$. Not cont. at $x = 1$ b/c $\lim_{x \to 1^+} g(x) \neq \lim_{x \to 1^-} g(x)$.
3. Hole at $x = -1$. Jump at $x = 4$.	4. Jump at $x = \pi$. Jump at $x = \frac{\pi}{2}$.
5. $k = \frac{28}{3}$	6. $k = -6$ and $k = 2$