1.11 Defining Continuity at a Point

Calculus Name: _____ **CA #2**

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

1. $f(x) = \begin{cases} e^x, & x \le \ln 3 \\ 3^x, & \ln 3 < x < 2 \\ x^2 + 3x - 1, & x \ge 2 \end{cases}$ Continuous at $x = \ln 3$? Continuous at $x = 2$?

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2. $g(x) = \begin{cases} \sin(2x), & x < -\pi \\ \cos\left(\frac{x}{2}\right), & -\pi \le x \le \frac{\pi}{2} \\ \sin(x), & x > \frac{\pi}{2} \end{cases}$ Continuous at $x = -\pi$? Continuous at $x = \frac{\pi}{2}$?

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

3. $h(x) = \begin{cases} \ln(ex), & x < 1 \\ 5, & x = 1 \\ 3x - 1, & 1 < x \le 3 \\ x^2 + 2 & x > 3 \end{cases}$

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

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

5. $g(x) = \begin{cases} 8 - 2x^2, & x \le -1 \\ 5x + k, & x > -1 \end{cases}$

6. $h(x) = \begin{cases} (k + x)(k - 3), & x \le 4 \\ k - 2x, & x > 4 \end{cases}$

Answers to 1.11 CA #2

1. NOT cont. at $x = \ln 3$ b/c $\lim_{x \to \ln 3^-} f(x) \ne \lim_{x \to \ln 3^+} f(x)$. Cont. at $x = 2$ b/c $f(2) = 9$ and $\lim_{x \to 2} f(x) = f(2)$.	2. Cont. at $x = -\pi$ b/c $g(-\pi) = 0$ and $\lim_{x \to -\pi} g(x) = g(-\pi)$. NOT cont. at $x = \frac{\pi}{2}$ b/c $\lim_{x \to \frac{\pi}{2}} f(x) \ne \lim_{x \to \frac{\pi}{2}} f(x)$.
3. Jump at $x = 1$. Jump at $x = 3$.	4. Hole at $x = -1$. Jump at $x = 1$.
5. $k = 11$	6. $k = 2$ and $k = -2$