

1.11 Defining Continuity at a Point

Calculus

Name: _____

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

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

2. $g(x) = \begin{cases} x^2 + 3x - 7, & x < -3 \\ 2x - 1, & -3 \leq x < 1 \\ \ln x, & x \geq 1 \end{cases}$ Continuous at $x = -3$? Continuous at $x = 1$?

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

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

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

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

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

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

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