Limits Worksheet Algebraically And Graphically Precalcus

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Part 1: Building a Foundation

What does the notation \(\lim_{x \to a} f(x) = L\) signify?

Hint: Think about what happens to the function as x approaches a.

- ◯ A) \(f(x)\) is undefined at \(x = a\)
- ◯ B) As \(x\) approaches \(a\), \(f(x)\) approaches \(L\)
- ◯ C) \(f(x)\) is always equal to \(L\)
- ◯ D) \(f(x)\) is discontinuous at \(x = a\)

Which of the following are methods to calculate limits algebraically?

Hint: Consider different algebraic techniques.

- ☐ A) Direct substitution
- ☐ B) Graphical analysis
- ☐ C) Factoring
- ☐ D) Rationalization

Explain what it means for a function to be continuous at a point \(a\).

Hint: Consider the definition of continuity.

List two types of discontinuities that can affect the existence of a limit.

Hint: Think about removable and non-removable discontinuities.

1. Type 1

2. Type 2

If \(\lim_{x \to a^-} f(x) \neq \lim_{x \to a^+} f(x)\), what can be concluded about \(\lim_{x \to a} f(x)\)?

Hint: Consider the implications of one-sided limits.

- ◯ A) The limit exists and equals \(f(a)\)
- ◯ B) The limit does not exist
- ◯ C) The limit is infinite
- ◯ D) The function is continuous at \(x = a\)

Part 2: Understanding and Interpretation

Which statement best describes a horizontal asymptote?

Hint: Think about the behavior of functions as x approaches infinity.

- ◯ A) A line that the graph of a function approaches as \(x\) approaches a finite value
- ◯ B) A line that the graph of a function approaches as \(x\) approaches infinity
- ◯ C) A point where the function is undefined
- ◯ D) A line that intersects the graph at multiple points

Which of the following statements are true about limits at infinity?

Hint: Consider the behavior of functions as they grow large.

- ☐ A) They describe the end behavior of a function
- ☐ B) They can determine vertical asymptotes
- ☐ C) They are always finite
- ☐ D) They can be used to find horizontal asymptotes

Describe how you would use a graph to determine if a function is continuous at a point.

Hint: Think about the visual representation of continuity.

Part 3: Application and Analysis

Given $f(x) = \frac{x^2 - 1}{x - 1}$, what is $\lim_{x \to 1} f(x)$?

Hint: Consider simplifying the function before evaluating the limit.

- ◯ A) 0
- ◯ B) 1
- ◯ C) 2
- ◯ D) Does not exist

Which of the following steps are necessary to find $\lim_{x \to 3} \frac{x^2 - 9}{x - 3}$?

Hint: Think about the algebraic techniques you can apply.

- ☐ A) Direct substitution
- ☐ B) Factoring the numerator
- ☐ C) Simplifying the expression
- ☐ D) Rationalizing the denominator

Explain how you would apply L'Hôpital's Rule to find the limit of $\frac{\sin x}{x}$ as x approaches 0.

Hint: Consider the conditions under which L'Hôpital's Rule is applicable.

Which of the following functions has a removable discontinuity at \(x = 2\)?

Hint: Consider the definition of removable discontinuity.

- ◯ A) \(f(x) = \frac{x^2 - 4}{x - 2}\)
- ◯ B) \(f(x) = \frac{x^2 + 4}{x - 2}\)
- ◯ C) \(f(x) = \frac{x^2 - 4}{x^2 - 4}\)
- ◯ D) \(f(x) = \frac{x + 2}{x - 2}\)

When analyzing the function \(f(x) = \frac{1}{x}\), which of the following are true?

Hint: Consider the behavior of the function around its discontinuities.

- ☐ A) The function has a vertical asymptote at \(x = 0\)
- ☐ B) The function is continuous for all \(x \neq 0\)
- ☐ C) The limit as \(x\) approaches 0 from the right is \(\infty\)
- ☐ D) The limit as \(x\) approaches 0 from the left is \(-\infty\)

Part 4: Evaluation and Creation

If a function \(f(x)\) has limits \(\lim_{x \to a^-} f(x) = 3\) and \(\lim_{x \to a^+} f(x) = 5\), what can be concluded about \(\lim_{x \to a} f(x)\)?

Hint: Consider the implications of one-sided limits.

- ◯ A) The limit is 4
- ◯ B) The limit does not exist
- ◯ C) The limit is 3
- ◯ D) The limit is 5

Which of the following are potential strategies to resolve an indeterminate form of type \(\frac{0}{0}\)?

Hint: Think about techniques used in calculus.

- ☐ A) Direct substitution
- ☐ B) L'Hôpital's Rule
- ☐ C) Factoring
- ☐ D) Adding a constant

Create a real-world scenario where understanding limits is crucial, and explain how limits help solve the problem.

Hint: Think about applications of limits in real life.