Limits Worksheet Algebraically And Graphically Precalculus

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Part 1: Building a Foundation

What is the notation used to represent the limit of a function \(f(x)\) as \(x\) approaches a value \(a\)?

Hint: Think about the standard mathematical notation for limits.

- ◯ A) \(f(a)\)
- ◯ B) \(\lim_{x \to a} f(x)\)
- ◯ C) \(f'(a)\)
- ◯ D) \(\int f(x) dx\)

Which of the following are methods used to evaluate limits algebraically? (Select all that apply)

Hint: Consider common algebraic techniques for finding limits.

- ☐ A) Substitution
- ☐ B) Factoring
- ☐ C) GraphING
- ☐ D) Rationalizing

Explain what a limit represents in the context of a function's behavior.

Hint: Think about how limits describe the behavior of functions near specific points.

List two types of discontinuities that can be identified using limits.

Hint: Consider the different ways a function can fail to be continuous.

1. Type 1

2. Type 2

What is the limit of a constant function $f(x) = c$ as x approaches any value a?

Hint: Consider the behavior of constant functions.

- ◯ A) 0
- ◯ B) c
- ◯ C) a
- ◯ D) Undefined

Part 2: Comprehension and Application

If $\lim_{x \to 3} f(x) = 7$, what does this imply about the function $f(x)$ as x approaches 3?

Hint: Think about the definition of limits and function behavior.

- ◯ A) $f(3) = 7$
- ◯ B) $f(x)$ becomes undefined at $x = 3$
- ◯ C) $f(x)$ approaches 7 as x approaches 3
- ◯ D) $f(x)$ has a discontinuity at $x = 3$

Which statements are true about one-sided limits? (Select all that apply)

Hint: Consider the definitions and properties of one-sided limits.

- ☐ A) They are used to determine the behavior of a function from one direction.
- ☐ B) They are always equal to the two-sided limit.
- ☐ C) They can help identify jump discontinuities.
- ☐ D) They are only applicable to polynomial functions.

Describe how the Squeeze Theorem can be used to find the limit of a function.

Hint: Think about how the Squeeze Theorem applies to bounding functions.

Given $f(x) = \frac{x^2 - 1}{x - 1}$, find $\lim_{x \to 1} f(x)$ using algebraic techniques.

Hint: Consider simplifying the function before evaluating the limit.

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

Part 3: Analysis, Evaluation, and Creation

Analyze the function $g(x) = \frac{x^2 - 4}{x - 2}$. What type of discontinuity does it have at $x = 2$?

Hint: Consider the behavior of the function around the point x = 2.

- A) Jump Discontinuity
- B) Infinite Discontinuity
- C) Removable Discontinuity
- D) No Discontinuity

Which of the following are true when analyzing the limit $\lim_{x \to 0} \frac{\sin x}{x}$? (Select all that apply)

Hint: Consider the properties of the sine function and its limit.

- A) The limit is evaluated using the Squeeze Theorem.
- B) The limit is 1.
- C) The function is continuous at $x = 0$.
- D) The limit does not exist.

Analyze the behavior of the function $h(x) = \frac{1}{x}$ as x approaches 0 from the left and right. What conclusions can you draw about its limits?

Hint: Think about the behavior of the function as it approaches the point from both sides.

Evaluate the following statement: "If \(\lim_{x \to a} f(x) = L\), then \(f(x)\) must be continuous at \(x = a\)."

Hint: Consider the definition of continuity in relation to limits.

- ◯ A) True
- ◯ B) False
- ◯ C) It depends on the function.
- ◯ D) This statement is always true.

Consider the real-world scenario where a car's speed is modeled by the function \(s(t) = \frac{100 t}{ t + 10}\). Evaluate the car's speed as time \(t \) approaches infinity. (Select all that apply)

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

- ☐ A) The speed approaches 10 units.
- ☐ B) The speed approaches 100 units.
- ☐ C) The speed becomes constant.
- ☐ D) The speed increases indefinitely.

Create a function that has a removable discontinuity at \(x = 3\) and explain how you would modify it to make it continuous.

Hint: Think about how to define a function with a hole at a specific point.

Propose two different functions that have the same limit as \(x\) approaches 2, but differ in their continuity at that point.

Hint: Consider functions that behave similarly near x = 2 but have different definitions.

1. Function 1

2. Function 2