Limits Quiz Answer Key PDF

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Which functions are continuous everywhere? (Select all that apply)

A. Polynomial functions ✓

B. Rational functions

C. Exponential functions ✓

D. Trigonometric functions ✓

Describe a real-world scenario where limits are used to model continuous change.

A real-world scenario where limits are used to model continuous change is in calculating the speed of a car at an exact moment in time. By taking the limit of the average speed as the time interval approaches zero, we can find the instantaneous speed of the car.

Which of the following statements about limits at infinity are true? (Select all that apply)

A. Limits at infinity can describe horizontal asymptotes. ✓

B. Limits at infinity always equal zero.

C. Limits at infinity can be finite or infinite. ✓

D. Limits at infinity are only applicable to polynomial functions.

What is the limit of f(x) = 5x - 3 as x approaches 1?

A. 2 ✓

B. 5

C. 8

D. 10

What is the significance of a horizontal asymptote in the context of limits at infinity?

The significance of a horizontal asymptote in the context of limits at infinity is that it represents the value that a function approaches as the independent variable tends towards positive or negative infinity.

Provide an example of a function with an infinite limit and explain the behavior of the function as it approaches the point of discontinuity.

The function $f(x) = 1/(x-2)$ has an infinite limit as x approaches 2, where f(x) approaches $+\infty$ as x approaches 2 from the right and $-\infty$ as x approaches 2 from the left.

Discuss the differences between a removable discontinuity and a jump discontinuity.

A removable discontinuity is characterized by a hole in the graph of a function, where the limit exists but the function is not defined at that point. In contrast, a jump discontinuity occurs when the left-hand limit and right-hand limit at a point are different, resulting in a 'jump' in the function's values.

How can the graphical behavior of a function help in understanding its limits? Provide an example.

The graphical behavior of a function helps in understanding its limits by visually showing how the function values behave as the input approaches a certain point. For instance, if we consider the function $f(x) = 1/x$ as x approaches 0, the graph shows that f(x) approaches infinity from the right and negative infinity from the left, indicating that the limit does not exist at $x = 0$.

Explain the concept of a limit using the epsilon-delta definition.

The limit of a function f(x) as x approaches a value a is L, denoted as lim (x -> a) f(x) = L, if for every $\varepsilon > 0$, there exists a $\delta > 0$ such that whenever $0 < |x - a| < \delta$, it follows that $|f(x) - L| < \varepsilon$.

Which of the following is a removable discontinuity?

A. Jump discontinuity
B. Infinite discontinuity
C. Hole in the graph ✓
D. Oscillating discontinuity

What is the limit of \frac{\sin x}{x} as x approaches 0?

A. 0

B. 1 ✓
C. \infty
D. Undefined

What is the limit of a constant function f(x) = 7 as x approaches any value a?

A. 0
B. 7 ✓
C. a
D. Does not exist

Which of the following are indeterminate forms that can be resolved using L'Hôpital's Rule? (Select all that apply)

A. \frac{0}{0} ✓
B. \frac{\infty}{\infty} ✓
C. \frac{1}{0}
D. 0 \times \infty

Which limit law allows you to separate the limit of a sum into the sum of limits?

A. Product Law
B. Quotient Law
C. Sum Law ✓
D. Power Law

Which of the following are true for a function to be continuous at a point x = a? (Select all that apply)

A. f(a) is defined. ✓
B. lim_{x \to a} f(x) exists. ✓
C. lim_{x \to a} f(x) = f(a). ✓
D. f(x) must be differentiable at x = a.

What is the limit of \frac{x^2 - 1}{x - 1} as x approaches 1?

A. 0
B. 1
C. 2 ✓

D. Does not exist

Which of the following functions has a horizontal asymptote at y = 0?

A. $f(x) = \frac{1}{x}$ ✓
B. $f(x) = x^2$
C. $f(x) = x + 1$
D. $f(x) = \sqrt{x}$

Which of the following are true about the Squeeze Theorem? (Select all that apply)

A. It can be used to find limits of functions that are difficult to evaluate directly. ✓
B. It requires two bounding functions. ✓
C. It is applicable only to polynomial functions.
D. It can be used to prove the limit of $\frac{\sin x}{x}$ as $x \to 0$. ✓

Which of the following limits do not exist? (Select all that apply)

A. $\lim_{x \to 0} \frac{1}{x}$ ✓
B. $\lim_{x \to \infty} \frac{1}{x}$
C. $\lim_{x \to 0} \sin \frac{1}{x}$ ✓
D. $\lim_{x \to 0} x^2$

Which of the following represents a finite limit?

A. $\lim_{x \to \infty} \frac{1}{x}$
B. $\lim_{x \to 0} \frac{1}{x}$
C. $\lim_{x \to 2} \frac{1}{x-2}$
D. $\lim_{x \to 0} \sin x$ ✓