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Continuity Quiz PDF

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Provide a detailed explanation of how limits are used to define continuity at a point.

Which of the following is not a type of discontinuity?

◯ Removable
◯ Jump
◯ Infinite
◯ Linear

Discuss the relationship between differentiability and continuity. Can a function be continuous but not differentiable? Provide an example.

Which theorem states that a continuous function on a closed interval takes on every value between its minimum and maximum values?

◯ Mean Value Theorem
◯ Intermediate Value Theorem

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○ Fundamental Theorem of Calculus
○ Extreme Value Theorem

What type of discontinuity occurs when a function has a hole at a point?

○ Jump discontinuity
○ Infinite discontinuity
○ Removable discontinuity
○ Oscillating discontinuity

Which functions have removable discontinuities? (Select all that apply)

☐ $f(x) = (x^2 - 1)/(x - 1)$
☐ $f(x) = 1/x$
☐ $f(x) = (x^2 - 4)/(x - 2)$
☐ $f(x) = \tan(x)$

Which of the following is a graphical indicator of continuity at a point?

○ A sharp corner
○ A vertical asymptote
○ A smooth curve with no breaks
○ A cusp

What is the significance of the Intermediate Value Theorem in calculus?

Which of the following scenarios demonstrate the Intermediate Value Theorem? (Select all that apply)

☐ A continuous function crosses the x-axis between two points.
☐ A continuous function reaches a maximum value within an interval.
☐ A continuous function has a derivative that changes sign.

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☐ A continuous function takes on every value between two points.

How can you determine if a function has a removable discontinuity? Provide an example.

Explain the difference between pointwise continuity and uniform continuity.

Describe a real-world scenario where the concept of continuity is crucial.

Which of the following statements about continuous functions are true? (Select all that apply)

☐ Continuous functions can have sharp corners.
☐ Continuous functions cannot have jumps.
☐ Continuous functions are always differentiable.
☐ Continuous functions have no breaks or holes.

What is the primary condition for a function to be uniformly continuous on an interval?

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○ The function is differentiable on the interval.
○ The function is bounded on the interval.
○ The function is continuous on the interval.
○ The function has a constant rate of change on the interval.

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

☐ $f(x) = x^2 + 3x + 2$
☐ $f(x) = 1/x$
☐ $f(x) = e^x$
☐ $f(x) = \sin(x)$

Which of the following functions is always continuous?

○ Polynomial functions
○ Rational functions
○ Piecewise functions
○ Trigonometric functions

Which of the following are characteristics of a uniformly continuous function? (Select all that apply)

☐ The function is continuous over a closed interval.
☐ The function's rate of change is constant.
☐ The function does not have any jumps or breaks.
☐ The function's continuity does not depend on the interval's size.

What is the definition of continuity at a point for a function?

○ The function has a derivative at that point.
○ The function is defined at that point.
○ The limit of the function as it approaches the point equals the function's value at that point.
○ The function is increasing at that point.

If a function is not continuous at a point, what can we say about the limit at that point?

○ The limit does not exist.
○ The limit exists but does not equal the function's value.
○ The limit equals the function's value.
○ The function is differentiable at that point.

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What are necessary conditions for a function to be continuous at a point c? (Select all that apply)

☐ f(c) is defined.
☐ lim (x -> c) f(x) exists.
☐ lim (x -> c) f(x) = f(c)
☐ f(x) is differentiable at c.

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