Chain Rule Quiz Answer Key PDF

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How does the Chain Rule extend to functions of multiple variables? Provide an example.

The Chain Rule extends to functions of multiple variables by allowing us to differentiate functions with respect to several variables. For example, if we have $z = f(x, y)$ where $x = g(t)$ and $y = h(t)$, we can use the Chain Rule to find $\frac{dz}{dt} = \frac{\partial f}{\partial x} \frac{dx}{dt} + \frac{\partial f}{\partial y} \frac{dy}{dt}$.

The Chain Rule is primarily used for which type of functions?

A. Linear functions

B. Polynomial functions

C. Composite functions ✓

D. Constant functions

Which of the following are components of the Chain Rule? (Select all that apply)

A. Outer function ✓

B. Inner function ✓

C. Product rule

D. Derivative of the inner function ✓

In multivariable calculus, the Chain Rule can be extended to:

A. Only one variable

B. Multiple variables ✓

C. Constant functions

D. Polynomial functions

If $y = \sin(x^2)$, what is the derivative $\frac{dy}{dx}$?

A. \cos(x^2)

B. 2x \cos(x^2) ✓

C. 2x \sin(x^2)

D. \cos(x)

What is the Chain Rule used for in calculus?

A. Integrating functions

B. Differentiating composite functions ✓

C. Solving algebraic equations

D. Finding limits

Which errors might occur when using the Chain Rule? (Select all that apply)

A. Forgetting to differentiate the inner function ✓

B. Using the sum rule instead

C. Applying the Chain Rule to non-composite functions ✓

D. Misidentifying the inner and outer functions ✓

Which of the following is a common mistake when applying the Chain Rule?

A. Forgetting to multiply by the derivative of the inner function ✓

B. Differentiating the outer function first

C. Using the product rule instead

D. Integrating instead of differentiating

Identify a common mistake students make when applying the Chain Rule and explain how to avoid it.

A common mistake when applying the Chain Rule is forgetting to multiply by the derivative of the inner function. To avoid this, students should always remember to differentiate both the outer and inner functions and then multiply their derivatives together.

What is a composite function, and how can you identify one?

A composite function is created when one function is applied to the result of another function. You can identify a composite function by looking for a function inside another function, such as f(g(x)).

Given the function $y = \tan(x^3 + x)$, outline the steps to find $\frac{dy}{dx}$ using the Chain Rule.

To find $\frac{dy}{dx}$ for $y = \tan(x^3 + x)$ using the Chain Rule, first identify the outer function as $\tan(u)$ and the inner function as $u = x^3 + x$. Then, differentiate the outer function to get $\sec^2(u)$ and the inner function to get $3x^2 + 1$. Finally, multiply these derivatives to obtain $\sec^2(x^3 + x) \cdot (3x^2 + 1)$.

Which functions are examples of composite functions? (Select all that apply)

A. $\sin(x)$

B. $\sin(x^2)$ ✓

C. $e^{(3x+1)}$ ✓

D. $x + 2$

Explain in your own words what the Chain Rule is and why it is important in calculus.

The Chain Rule is a method used in calculus to find the derivative of composite functions. It is important because many functions in calculus are composed of other functions, and the Chain Rule provides a systematic way to differentiate them.

Describe the process of using the Chain Rule to differentiate the function $y = \sqrt{3x^2 + 4}$.

To differentiate $y = \sqrt{3x^2 + 4}$ using the Chain Rule, first identify the outer function as $\sqrt{u}$ and the inner function as $u = 3x^2 + 4$. Then, differentiate the outer function to get $\frac{1}{2\sqrt{u}}$ and the inner function to get $6x$. Finally, multiply these derivatives to obtain $\frac{6x}{2\sqrt{3x^2 + 4}}$.

For the function $y = (3x^2 + 2)^5$, which steps are necessary to find $\frac{dy}{dx}$? (Select all that apply)

A. Differentiate the outer function as $5(3x^2 + 2)^4$ ✓

B. Differentiate the inner function as $6x$ ✓

C. Multiply the derivatives ✓

D. Subtract the derivatives

For the function y = \cos(5x^2), which steps are involved in finding \frac{dy}{dx}? (Select all that apply)

A. Differentiate \cos to get -\sin ✓

B. Differentiate 5x^2 to get 10x ✓

C. Multiply -\sin(5x^2) by 10x ✓

D. Add the derivatives

For the function y = \ln(x^4 + 3), what is the derivative \frac{dy}{dx}?

A. \frac{1}{x^4 + 3}

B. \frac{4x^3}{x^4 + 3} ✓

C. \frac{4x^3}{x^4}

D. \frac{4x^3}{3}

In which scenarios is the Chain Rule applicable? (Select all that apply)

A. Differentiating e^{x^2} ✓

B. Differentiating \ln(x^3 + 1) ✓

C. Differentiating x^2 + 3x

D. Differentiating \sin(\cos(x)) ✓

In the function y = e^{(3x+1)}, what is the derivative \frac{dy}{dx}?

A. e^{(3x+1)}

B. 3e^{(3x+1)} ✓

C. e^{3x}

D. 3e^{x}

Which step is crucial in applying the Chain Rule correctly?

A. Identifying the outer function only

B. Identifying the inner function only

C. Differentiating both functions and multiplying ✓

D. Integrating both functions