Product Rule Quiz Answer Key PDF

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Differentiate the function f(x) = (2x^3)(ln(x)) using the product rule and show your work.

f'(x) = (6x^2)(ln(x)) + (2x^3)(1/x) = 6x^2 ln(x) + 2x^2.

Provide an example of a function where the product rule is used in combination with another derivative rule. Explain your approach.

Let f(x) = x^2 * sin(g(x)). To find f'(x), we use the product rule: f'(x) = (x^2)' * sin(g(x)) + x^2 * (sin(g(x)))'. The derivative of x^2 is 2x, and for sin(g(x)), we apply the chain rule: (sin(g(x)))' = cos(g(x)) * g'(x). Thus, f'(x) = 2x * sin(g(x)) + x^2 * cos(g(x)) * g'(x).

What is the derivative of u(x) = x^2 and v(x) = x^3 using the product rule?

A. 5x^4 ✓

B. 2x^5

C. 5x^5

D. x^5

The product rule can be applied to which of the following function types?

A. Polynomial functions ✓

B. Exponential functions ✓

C. Trigonometric functions ✓

D. Logarithmic functions ✓

What mistake is commonly made when applying the product rule?

A. Forgetting to multiply

B. Forgetting to add the two terms ✓

C. Confusing it with the sum rule

D. Applying it to a single function

If u(x) = x^3 and v(x) = sin(x), what is u'(x)?

A. 3x^2 ✓
B. cos(x)
C. x^3
D. sin(x)

Which of the following functions can the product rule be applied to?

A. f(x) = x^2 + 3x
B. f(x) = x^2 * e^x ✓
C. f(x) = ln(x)
D. f(x) = e^x

What is the product rule used for in calculus?

A. Finding the integral of a product of two functions
B. Finding the derivative of a product of two functions ✓
C. Solving algebraic equations
D. Finding the limit of a function

In which scenarios is the product rule not applicable?

A. When functions are added ✓
B. When functions are multiplied
C. When functions are divided ✓
D. When a single function is differentiated ✓

What are common errors when using the product rule?

A. Incorrect differentiation of one or both functions ✓
B. Misapplication of the chain rule instead ✓
C. Forgetting to apply the rule to each function
D. Incorrectly adding the derivative terms ✓

Describe a real-world scenario where the product rule might be applied and explain why it is useful.

A real-world scenario where the product rule might be applied is in calculating the revenue of a company, where revenue (R) is the product of the price per unit (P) and the number of units sold (Q). The derivative of revenue with respect to time can be found using the product rule: dR/dtime = P * dQ/dtime + Q * dP/dtime, which helps in understanding how changes in price and quantity affect overall revenue.

Which rule is often confused with the product rule?

A. Chain rule ✓
B. Quotient rule
C. Power rule
D. Sum rule

Discuss a common mistake made when applying the product rule and how it can be avoided.

One common mistake is neglectfully applying the product rule as f(x)g'(x) + g(x)f'(x) without differentiating both functions. To avoid this, always remember to apply the rule correctly by differentiating each function in the product.

Explain why the product rule is necessary in calculus.

The product rule states that if you have two functions u(x) and v(x), the derivative of their product is given by (u*v)' = u'v + uv'. This rule is necessary to correctly compute the derivative of products of functions.

In the product rule formula (uv)' = u'v + uv', what does u' represent?

A. The original function u(x)
B. The derivative of v(x)
C. The derivative of u(x) ✓
D. The product of u(x) and v(x)

Which of the following are examples of real-world applications of the product rule?

A. Calculating work done in physics ✓
B. Determining the rate of change of momentum ✓

C. Solving quadratic equations

D. Analyzing population growth models ✓

Which of the following expressions require the use of the product rule to differentiate?

A. x^2 + 3x

B. x^2 * sin(x) ✓

C. e^x * ln(x) ✓

D. cos(x) + sin(x)

Which of the following are necessary steps to apply the product rule?

A. Identify the two functions ✓

B. Differentiate each function ✓

C. Add the derivatives of the functions

D. Multiply the derivatives of the functions

Which of the following is the correct formula for the product rule?

A. (uv)' = u'v - uv'

B. (uv)' = u'v + uv' ✓

C. (uv)' = uv' + u'v'

D. (uv)' = u'v' + uv

How does the product rule differ from the chain rule, and when would you use each?

The product rule states that if you have two functions u(x) and v(x), the derivative of their product is u'v + uv'. The chain rule states that if you have a composite function f(g(x)), the derivative is f'(g(x))g'(x). Use the product rule for products of functions and the chain rule for compositions of functions.