

§2.3: PRODUCT AND QUOTIENT RULES

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ANNOUNCEMENTS

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PREVIEW ACTIVITY DISCUSSION

GOAL

Understand how the differentiation process interacts with our other algebraic operations: multiplication and division.

PRODUCT RULE

Theorem

If f and g are differentiable functions of x , then their product $P(x) = f(x) \cdot g(x)$ is also a differentiable function, and

$$P'(x) = f(x)g'(x) + g(x)f'(x).$$

EXAMPLE

Let's calculate the derivative of $s(x) = \sin x \cos x$.

ACTIVITY 2.3.2

THE IDEA OF THE QUOTIENT RULE

How do we differentiate $Q = f/g$? By applying the product rule to $f = gQ$.

THE QUOTIENT RULE

Theorem

If f and g are differentiable functions, then their quotient $Q(x) = \frac{f(x)}{g(x)}$ is also a differentiable function for all x where $g(x) \neq 0$ and

$$Q'(x) = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}.$$

ACTIVITY 2.3.3

ACTIVITY 2.3.4