

The Product and Quotient Rules

Section 3.2

The Product Rule

Example:

Differentiate $h(x) = x^2(2x^3 + 1)$ by first expanding.

* Note: $(f(x)g(x))' \neq f(x)' \cdot g(x)'$

The Product Rule

$$[f(x) \cdot g(x)]' = f'(x) \cdot g(x) + f(x) \cdot g'(x)$$

provided f and g are differentiable functions.

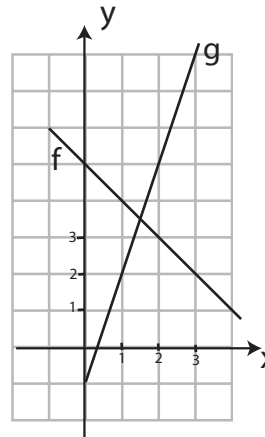
Example (revisited):

Now, find $h'(x)$ again, this time using the product rule.

The Product Rule

1. Determine where the graph of $f(x) = x^4 e^x$ has horizontal tangent lines.

2. Given the graphs of $f(x)$ and $g(x)$, find $(fg)'(1)$.



The Quotient Rule

$$\left[\frac{f(x)}{g(x)} \right]' = \frac{f'(x) \cdot g(x) - f(x) \cdot g'(x)}{[g(x)]^2}$$

provided f and g are differentiable and $g(x) \neq 0$.

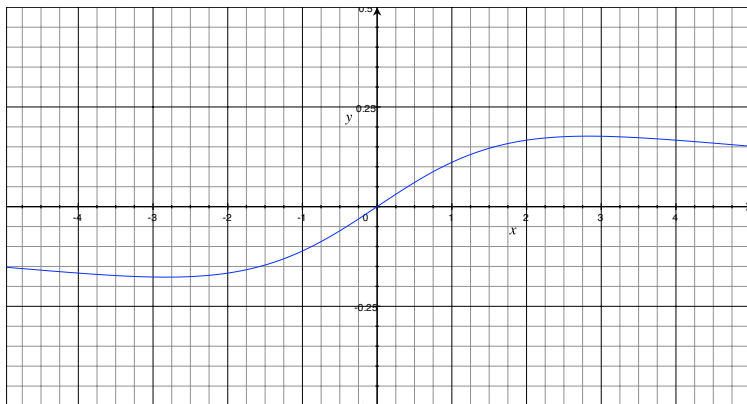
* Note: $\left(\frac{f}{g} \right)' \neq \frac{f'}{g'}$

The Quotient Rule

1. Determine where the function

$$q(x) = \frac{x}{x^2 + 8}$$

has horizontal tangents.



2. Given the graphs of $f(x)$ and $g(x)$, find

$$\left(\frac{f}{g}\right)'(1)$$

