

Section 3.2: Product and Quotient Rules

Product Rule If $y = f(x)g(x)$ and both $f'(x)$ and $g'(x)$ exists then

$$y' = f'(x)g(x) + f(x)g'(x)$$

Example: Find the derivative of $y = (x^6 + 7)(x^2 + x)$

Example: Find f'' for $f(x) = (x^6 + 7)e^x$

Quotient Rule If $y = \frac{f(x)}{g(x)}$ and both $f'(x)$ and $g'(x)$ exists then

$$y' = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$$

Example: Find the derivatives of these functions.

A) $y = \frac{1 - x^2}{1 + x^2}$

$$\text{B) } y = \frac{5}{m^6 + 2}$$

Example: Find y'' for $y = \frac{x^3}{x+1}$

Example: Find the equation of the tangent line at $x = 1$ $f(x) = \frac{x^2 e^x}{x^5 + 3}$

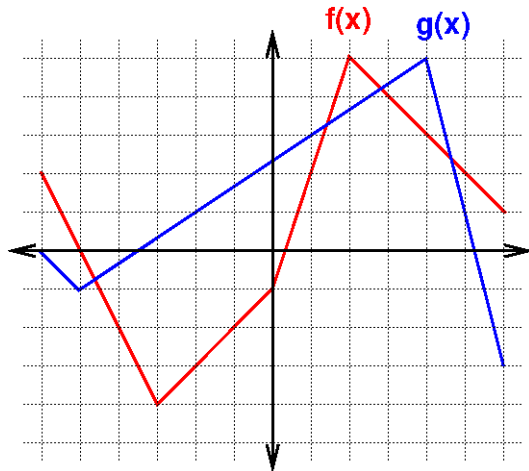
Example: The functions f and g that satisfy the properties as shown in the table. Find the indicated quantity.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	1	-3	3	5
1	2	9	7	11
2	-5	0	2	10
3	4	-1	-4	8

A) $H'(3)$ if $H(x) = (x^3 + 2)g(x)$

B) $\frac{d}{dx} \left(\frac{x^3}{f(x)} \right) \Big|_{x=1}$

Example Use the graph for the following.



Find $H'(-2)$ if $H(x) = f(x)g(x)$

B) Find $R'(1)$ if $R(x) = \frac{x^2 + 2}{f(x)}$