

3.2 The Product and Quotient Rule

Objectives: Use the product and quotient rule to find derivatives of functions.

The Product Rule

$$\frac{d}{dx}[f(x) \cdot g(x)] =$$

Proof

Example 1 Find the derivative of $f(x) = (3x^2 + 8x - 5)(5x^2 - 2x - 9)$

Example 2 Find $f'(0)$ given $f(x) = 5e^x(x^2 - 3x + 1)$, and where $f'(x) = 0$.

Example 3 Find the derivative of $y = (2x + 3)(5x - 2)(4x + 1)$

The Quotient Rule

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] =$$

One way to memorize this is the saying, “low d high, minus high d low, over low low”. ☺

Example 4 Find $\frac{d}{dx}\left[\frac{3x-5}{2x+1}\right]$

Example 5 Find the equation of the line tangent to the curve $y = \frac{4x^3+2x}{x^2+x}$ when $x = 1$.

Example 6 Find $\frac{d}{dx}\left[\frac{4e^x\sqrt{x}}{3x+5}\right]$

💡 **Challenge** A frog is walking from left to right on the hill $y = 9 - x^2$ looking for lunch. On the other side of the hill is a fly resting at the point $(10, 0)$. What are the coordinates on the hill when the frog first sees the fly?