

Product Rule

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

In other words, the derivative of a product of two functions is the first function times the derivative of the second function plus the second function times the derivative of the first.

Note: For the product rule it doesn't matter which part you put first since there is a + sign between.

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Quotient Rule

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

The derivative of a quotient is the denominator times the derivative of the numerator minus the numerator times the derivative of the denominator, all divided by the square of the denominator. ($\frac{\text{lodhi} - \text{hidlo}}{\text{lolo}}$)

Note: For the quotient rule it makes a big difference which part you do first. You must do the denominator times the derivative of the numerator FIRST or you will get the wrong answer since there is a minus sign between terms.

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DEFINITION

Average Cost per unit= $AC(x) = \frac{C(x)}{x}$. Similar definitions apply for Average Revenue and Average Profit.

Marginal average cost is the rate at which average cost is changing, $MAC(x) = \frac{d}{dx} \left[\frac{C(x)}{x} \right]$

Marginal Average Revenue is the rate at which Average Revenue is changing, $MAR(x) = \frac{d}{dx} \left[\frac{R(x)}{x} \right]$

Marginal Average Profit is the rate at which Average Profit is changing, $MAP(x) = \frac{d}{dx} \left[\frac{P(x)}{x} \right]$

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