a special case

example

a special case

If $g(x) = c$ is constant then so $\dfrac{d}{dx}\big(cf(x)\big) = c\dfrac{d}{dx}\big(f(x)\big) = cf'(x)$

The sum rule can then be generalized as:

If $f_1, f_2, \cdots, f_n$ are differentiable and $a_1, a_2, \cdots, a_n$ are constants, then

$$\frac{d}{dx}\big(a_1 f_1(x) + a_2 f_2(x) + \cdots + a_n f_n(x)\big) = a_1 f'(x) + a_2 f_2'(x) + \cdots + a_n f_n'(x)$$

example

Differentiating polynomial of degree n with constant coefficients given by

$$f(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \cdots + a_n x^n$$

yields a polynomial of degree $n - 1$ with constant coefficients given by

$$f'(x) = a_1 + 2a_2 x + 3a_3 x^2 + \cdots + n a_n x^{n-1}$$

the product rule