ПРОИЗВОДНЫЕ формулы

ТАБЛИЦА ПРОИЗВОДНЫХ

$$(c)' = 0,\ c = \text{const}$$

$$(x^n)' = nx^{n-1}$$

$$(a^x)' = a^x \cdot \ln a$$

$$(e^x)' = e^x$$

$$(\log_a x)' = \frac{1}{x \ln a}$$

$$(\ln x)' = \frac{1}{x}$$

$$(\sin x)' = \cos x$$

$$(\cos x)' = -\sin x$$

$$(\sqrt{x})' = \frac{1}{2\sqrt{x}}$$

$$(\mathrm{tg} x)' = \frac{1}{\cos^2 x}$$

$$(\mathrm{ctg} x)' = -\frac{1}{\sin^2 x}$$

$$(\arcsin x)' = \frac{1}{\sqrt{1-x^2}}$$

$$(\arccos x)' = -\frac{1}{\sqrt{1-x^2}}$$

$$(\mathrm{arctg} x)' = \frac{1}{1+x^2}$$

$$(\mathrm{arcctg} x)' = -\frac{1}{1+x^2}$$

$$(\mathrm{sh}\, x)' = \mathrm{ch}\, x$$

$$(\mathrm{ch}\, x)' = \mathrm{sh}\, x$$

$$(\mathrm{th}\, x)' = \frac{1}{\mathrm{ch}^2 x}$$

$$(\mathrm{cth}\, x)' = -\frac{1}{\mathrm{sh}^2 x}$$

ОСНОВНЫЕ ПРАВИЛА ДИФФЕРЕНЦИРОВАНИЯ

$$(Cu)' = Cu'$$

$$(uv)' = u'\, v + u\, v'$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

$$(C)' = 0$$

$$(u \pm v)' = u' \pm v'$$

$$\left(\frac{u}{v}\right)' = \frac{u'\, v - u\, v'}{v^2}$$

$$y' = y\, (\ln y)'$$

$$(u^v)' = vu^{v-1}u' + u^v v' \ln u$$

ПОНЯТИЕ ПРОИЗВОДНОЙ

$$f'(x_0) = \lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x} = \lim_{\Delta x \to 0} \frac{f(x_0 + \Delta x) - f(x_0)}{\Delta x}.$$

ТЕОРЕМА КОШИ

$$\frac{f(b) - f(a)}{g(b) - g(a)} = \frac{f'(c)}{g'(c)}.$$

ТЕОРЕМА ЛАГРАНЖА

$$f(b) - f(a) = f'(c)(b - a).$$

ЛОГАРИФМИЧЕСКАЯ ПРОИЗВОДНАЯ

$$(u^v)' = u^v \cdot v' \cdot \ln u + u^{v-1} \cdot u' \cdot v.$$

$$(\ln y)' = \frac{y'}{y}.$$

ФОРМУЛА МАКЛОРЕНА

$$f(x) = f(0) + \frac{f'(0)}{1!}x + \frac{f''(0)}{2!}x^2 + \dots + \frac{f^{(n)}(0)}{n!}x^n + o(x^n), \quad x \to 0$$

ФОРМУЛА ТЕЙЛОРА

$$f(x) = f(x_0) + \frac{f'(x_0)}{1!}(x - x_0) + \frac{f''(x_0)}{2!}(x - x_0)^2 + \dots$$

$$\dots + \frac{f^{(n)}(x_0)}{n!}(x - x_0)^n + o\big((x - x_0)^n\big) \text{ при } x \to x_0.$$

ПРОИЗВОДНАЯ СЛОЖНОЙ И НЕЯВНОЙ ФУНКЦИИ

$$z' = \frac{dz}{dt} = \frac{d\varphi}{dt} = \frac{\partial z}{\partial x}\frac{dx}{dt} + \frac{\partial z}{\partial y}\frac{dy}{dt}.$$

$$\frac{\partial z}{\partial u} = \frac{\partial z}{\partial x}\frac{\partial x}{\partial u} + \frac{\partial z}{\partial y}\frac{\partial y}{\partial u} \quad \text{и} \quad \frac{\partial z}{\partial v} = \frac{\partial z}{\partial x}\frac{\partial x}{\partial v} + \frac{\partial z}{\partial y}\frac{\partial y}{\partial v}.$$

$$y' = \frac{dy}{dx} = -\frac{F'_x(x;y)}{F'_y(x;y)}. \quad y'(x_0) = -\frac{F'_x(x_0;y_0)}{F'_y(x_0;y_0)}.$$

$$\frac{\partial z}{\partial x} = -\frac{F'_x(x;y;z)}{F'_z(x;y;z)}, \quad \frac{\partial z}{\partial y} = -\frac{F'_y(x;y;z)}{F'_z(x;y;z)}.$$