Производные

1) $(x^\alpha)' = \alpha x^{\alpha-1}$

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

3) $(f+g)' = f' + g'$

4) $(fg)' = f'g + fg'$, $\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

5) $f \circ g = f'(g) \cdot g'$

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

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

8) $(\operatorname{tg} x)' = \left(\frac{\sin x}{\cos x}\right)' = \frac{\cos x \cdot \cos x + \sin x \cdot \sin x}{(\cos x)^2} = \frac{1}{\cos^2 x}$

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

9) $(f^{-1})' = \frac{1}{f'}$

10) $(\operatorname{arctg} x)' = \frac{1}{(\operatorname{tg} y)'} = \frac{1}{\frac{1}{\cos^2 y}} = \cos^2 y$ (=)

$\operatorname{tg} y = x \Rightarrow \frac{\sin^2 y}{\cos^2 y} = x^2 \Rightarrow \frac{1-\cos^2 y}{\cos^2 y} = x^2$

$1 = \cos^2 y + x^2 \cos^2 y \Rightarrow \cos^2 y = \frac{1}{1+x^2}$

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

11) $(\operatorname{arcctg} x)' = -\sin^2 y = \frac{-1}{1+x^2}$

$\operatorname{ctg} y = x \Rightarrow \frac{\cos^2 y}{\sin^2 y} = x \Rightarrow \frac{1-\sin^2 y}{\sin^2 y} = x \Rightarrow \sin^2 y = \frac{1}{1+x^2}$

12) $\ln x = \frac{1}{(e^y)'} = \frac{1}{e^y} = \frac{1}{x}$

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

$\sin y = x \Rightarrow \cos y = \sqrt{1-x^2}$

14) $\arccos(x) = \frac{1}{-\sin y} = \frac{-1}{\sqrt{1-x^2}}$