DERIVATIVES OF ELEMENTARY FUNCTIONS

1. $[c]' = 0,\ c \in R$

2. $[x^n]' = n\,x^{n-1},\ n \in N,\ x \in R$

   $[x^\alpha]' = \alpha\,x^{\alpha-1},\ \alpha \in R,\ x \in (0, \infty)$

3. $[a^x]' = a^x \cdot \ln a,\ a > 0,\ a \neq 1,\ x \in R$

   $[e^x]' = e^x,\ x \in R$

4. $[\log_a x]' = \dfrac{1}{x \ln a},\ a > 0,\ a \neq 1,\ x \in (0, \infty)$

   $[\ln x]' = \dfrac{1}{x},\ x \in (0, \infty)$

5. $[\sin x]' = \cos x,\ x \in R$

6. $[\cos x]' = -\sin x,\ x \in R$

7. $[\operatorname{tg} x]' = \dfrac{1}{\cos^2 x},\ x \neq \dfrac{\pi}{2} + k\pi, k \in Z$

8. $[\operatorname{cotg} x]' = \dfrac{-1}{\sin^2 x},\ x \neq k\pi, k \in Z$

9. $[\arcsin x]' = \frac{1}{\sqrt{1-x^2}}, x \in (-1,1)$

10. $[\arccos x]' = \frac{-1}{\sqrt{1-x^2}}, x \in (-1,1)$

11. $[\operatorname{arctg} x]' = \frac{1}{1+x^2}, x \in R$

12. $[\operatorname{arccotg} x]' = \frac{-1}{1+x^2}, x \in R$

13. Derivative of functions of type $f(x)^{g(x)}$

$$(f(x))^{g(x)} = e^{\ln((f(x))^{g(x)}} = e^{g(x).\ln f(x)},\ f(x) > 0$$

$$[(f(x))^{g(x)}]' = [e^{g(x).\ln f(x)}]' =$$

$$= e^{g(x).\ln f(x)}.(g'(x).\ln f(x) + g(x).\frac{f'(x)}{f(x)})$$

14. Logarithmic differentiation

$$[\ln f(x)]' = \frac{f'(x)}{f(x)}, \quad f(x) > 0$$

$$f'(x) = f(x).[\ln f(x)]'$$