

1 Differential Calculus

1.1 basic formulas

$$(\tan(x))' = \sec^2(x), (\csc(x))' = \csc(x)\cot(x)$$

$$(\sec(x))' = \sec(x)\tan(x), (\cot(x))' = -\csc^2(x)$$

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

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

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

1.2 Limits

$$\lim_{x \rightarrow 0} \frac{\sin(x)}{x} = 1$$

1.3 Derivatives of inverse trigonometric functions

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

$$(\tan^{-1}(x))' = \frac{x'}{x^2+1}, (\cot^{-1}(x))' = \frac{-x'}{x^2+1}$$

$$(\sec^{-1}(x))' = \frac{x'}{|x|\sqrt{x^2-1}}, (\csc^{-1}(x))' = \frac{-x'}{|x|\sqrt{x^2-1}}$$

1.4 Derivatives of Hiperbolic functions

$$(\sinh(x))' = \cosh(x), (\cosh(x))' = \sinh(x)$$

$$(\tanh(x))' = \text{sech}^2(x), (\coth(x))' = -\text{csch}^2(x)$$

$$(\text{sech}(x))' = -\text{sech}(x)\tanh(x), (\text{csch}(x))' = -\text{csch}(x)\coth(x)$$