Rules of Differentiation (Derivatives)

ALGEBRAIC RULES

Constant Rule $y = c \rightarrow y' = 0$

Power Rule $y = x^n \rightarrow y' = n * x^{n-1}$

Product Rule $y = f(x) * g(x) \rightarrow y' = f(x) * g'(x) + g(x) * f'(x)$

Quotient Rule $y = \dfrac{f(x)}{g(x)} \rightarrow y' = \dfrac{g(x) f'(x) - f(x) * g'(x)}{[g(x)]^2}$

Chain Rule $y = f(g(x)) \rightarrow y' = f'(g(x)) * g'(x)$

Exponential $y = a^x \rightarrow y' = a^x * \ln(a)$ $\quad y = a^{f(x)} \rightarrow y' = a^{f(x)} * \ln(a) * f'(x)$

$y = e^x \rightarrow y' = e^x$ $\quad y = e^{f(x)} \rightarrow y' = e^{f(x)} * f'(x)$

Logarithms $y = \log_a(x) \rightarrow y' = \dfrac{1}{x * \ln(a)}$ $\quad y = \log_a f(x) \rightarrow y' = \dfrac{f'(x)}{f(x) \ln a}$

$y = \ln(x) \rightarrow y' = \dfrac{1}{x}$ $\quad y = \ln f(x) \rightarrow y' = \dfrac{f'(x)}{f(x)}$

TRIGONOMETRIC RULES

$y = \sin x \rightarrow y' = \cos x$

$y = \cos x \rightarrow y' = -\sin x$

$y = \tan x \rightarrow y' = \sec^2 x$

$y = \csc x \rightarrow y' = -\csc x \cot x$

$y = \sec x \rightarrow y' = \sec x \tan x$

$y = \cot x \rightarrow y' = -\csc^2 x$

Inverse Trig Functions (Most Notable!)

$y = \sin^{-1} x \rightarrow y' = \dfrac{1}{\sqrt{1 - x^2}}$

$y = \sin^{-1}(f(x)) \rightarrow y' = \dfrac{f'(x)}{\sqrt{1 - (f(x))^2}}$

$y = \tan^{-1} x \rightarrow y' = \dfrac{1}{1 + x^2}$

$y = \tan^{-1}(f(x)) \rightarrow y' = \dfrac{f'(x)}{1 + (f(x))^2}$