

$$y = \ln(x)$$

$$\begin{aligned} \frac{dy}{dx} &= \frac{\Delta y}{\Delta x} = \frac{\ln(x + \Delta x) - \ln(x)}{\Delta x} \\ &= \frac{\ln\left(\frac{x + \Delta x}{x}\right)}{\Delta x} = \frac{1}{\Delta x} \cdot \ln\left(1 + \frac{\Delta x}{x}\right) \end{aligned}$$

$$\frac{x}{\Delta x} = \mu \rightarrow \frac{1}{\Delta x} = \frac{\mu}{x}; \quad \frac{\Delta x}{x} = \frac{1}{\mu}$$

$$\frac{\Delta y}{\Delta x} = \frac{\mu}{x} \cdot \ln\left(1 + \frac{1}{\mu}\right) = \frac{1}{x} \cdot \ln\left(1 + \frac{1}{\mu}\right)^\mu$$

$\lim_{\Delta x \rightarrow 0}$

$$\left(1 + \frac{1}{\mu}\right)^\mu \text{ mit } \mu \rightarrow \infty = e$$

$$\frac{\Delta y}{\Delta x} = \frac{1}{x} \cdot \ln e; \quad \ln e = 1$$

$\lim_{\Delta x \rightarrow 0}$

$$\frac{\Delta y}{\Delta x} = \frac{1}{x}$$

$\lim_{\Delta x \rightarrow 0}$

$$\frac{dy}{dx} = \frac{1}{x}$$

$$\frac{d \ln(x)}{dx} = \frac{1}{x}$$

$$\ln(x) = \int \frac{dx}{x}$$