

$$\text{Let } f(x) = 2^x$$

$$\frac{df}{dx} \quad \ln(f) = \ln 2^x = x \ln 2$$

$$\frac{1}{f} \cdot f' = \ln 2$$

$$f' = f \cdot \ln 2$$

$$f' = 2^x \cdot \ln 2$$

$$f(x) = a^x \rightarrow \frac{df}{dx} = a^x \cdot \ln a$$

$$\text{Let } f(x) = 3^{\cos x}$$

$$\text{Find } \frac{df}{dx} = 3^{\cos x} \cdot \ln 3 (-\sin x)$$

chain rule

b/c of base 3.

$$f(x) = \pi^{\arctan(2x)}$$

$$f' = \pi^{\arctan(2x)} \cdot \ln(\pi) \cdot \frac{1}{1+(2x)^2} \cdot 2$$

$$\text{Let } f(x) = \log_2 x \quad \left[\log_a b = \frac{\ln b}{\ln a} \right]$$

$$\text{Find } \frac{df}{dx} \quad \left[\frac{\ln x}{\ln 2} = \frac{1}{\ln 2} (\ln x) \right]$$

$$f'(x) = \frac{1}{\ln 2} \cdot \frac{1}{x} = \frac{1}{x \ln 2}$$

$$\text{Let } f(x) = \log_a x$$

$$\frac{df}{dx} = \frac{1}{x \ln a}$$

$$\text{Let } y = \log_3 |\sec x|$$

$$\begin{aligned} \text{Find } \frac{dy}{dx} &= \frac{1}{\cancel{\sec x} (\ln 3)} \cdot \cancel{\sec x} \tan x \\ &= \frac{\tan x}{\ln 3} \end{aligned}$$