$$
\begin{aligned}
& \text { Let } f(x)=2^{x} \\
& \begin{aligned}
\frac{d f}{d x} \quad \ln (f) & =\ln 2^{x}=x \ln 2 \\
\frac{1}{f} \cdot f^{\prime} & =\ln 2 \\
f^{\prime} & =f \cdot \ln 2 \\
f^{\prime} & =2^{x} \cdot \ln 2 \\
f(x)=a^{x} & \rightarrow \frac{d f}{d x}=a^{x} \cdot \ln a
\end{aligned}
\end{aligned}
$$

$$
\begin{aligned}
& \text { Let } f(x)=3^{\cos x} \\
& \text { Find } \frac{d f}{d x}=3^{\cos ^{\cos x}} \operatorname{chan}^{\ln 3(-\sin x)} \\
& \text { of base } 3 .
\end{aligned}
$$

$$
\begin{aligned}
& f(x)=\pi^{\arctan (2 x)} \\
& f^{\prime}=\pi^{\arctan (2 x)} \cdot \ln (\pi) \cdot \frac{1}{1+(2 x)^{2}} \cdot 2
\end{aligned}
$$

Let $f(x)=\log _{2} x \quad \log _{a} b=\frac{\ln b}{\ln a}$
Find $\left.\frac{d f}{d x}\right\} \frac{\ln x}{\ln 2}=\frac{1}{\ln 2}(\ln x)$

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

Let $f(x)=\log _{a} x$

$$
\frac{d f}{d x}=\frac{1}{x \ln a}
$$

$$
\begin{aligned}
& \text { Let } y=\log _{3}|\sec x| \\
& \begin{aligned}
\text { Find } \frac{d y}{d x} & =\frac{1}{\sec x(\ln 3)} \cdot \sec x \tan x \\
& =\frac{\tan x}{\ln 3}
\end{aligned}
\end{aligned}
$$

