Find $\frac{dy}{dx}$ if y = ln (csc 3x) at x = π/4

$\frac{dy}{dx} = \frac{1}{\csc 3x} \cdot -\csc 3x \cot 3x \cdot 3 = -3\cot 3x$

$= -3\cot 3\pi/4 = 3$

$\frac{dy}{dx}$ = _____

Given y = $\log_4 x^2$, evaluate y'(3)

$y = \frac{\ln x^2}{\ln 4}$ $y' = \frac{1}{\ln 4} \cdot \frac{d}{dx} \ln x^2$

$= \frac{1}{\ln 4} \cdot \frac{1}{x^2} \cdot 2x = \frac{2}{x \ln 4} \rightarrow \frac{2}{3} \cdot \frac{1}{\ln 4}$

answer: _____

Given y = $(\sec x)^x$, find $y'(\frac{\pi}{3})$ $\ln y = \ln (\sec x)^x = x \ln (\sec x)$

$\frac{d}{dx} \ln y = \frac{d}{dx}(x \ln(\sec x)) \rightarrow \frac{1}{y}\frac{dy}{dx} = 1 \cdot \ln(\sec x) + \frac{1}{\sec x} \cdot \sec x \tan x(x)$

$\frac{dy}{dx} = (\sec x)^x (\ln(\sec x) + x \tan x)$

$= (\sec \frac{\pi}{3})^{\pi/3} \cdot (\ln(\sec \pi/3) + \frac{\pi}{3}\tan\frac{\pi}{3})$

$= 2^{\pi/3} \cdot (\ln 2 + \frac{\pi}{3} \cdot \sqrt{3})$

answer: _____