Calculus Study Guide: section 3.10

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

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

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

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

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

$\log_4 x^2 = \frac{\ln x^2}{\ln 4}$

$\frac{d}{dx}\left(\frac{\ln x^2}{\ln 4}\right) = \frac{1}{\ln 4}\frac{d}{dx}(\ln(x^2))$ → $\frac{1}{\ln 4}\cdot\frac{1}{x^2}\cdot 2x = \frac{2}{x\ln 4}$

$\frac{2}{3\ln 4}$

answer: $\frac{2}{3\ln 4}$

Find the derivative $\frac{dy}{dx}$.

$y = 4^x$

$\frac{dy}{dx} = 4^x \ln 4$

$y = x^2 4^{3x}$

$\frac{dy}{dx} = 2x\,4^{3x} + x^2 \cdot 4^{3x} \cdot \ln 4 \cdot 3$

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

Find an equation of the tangent line at the point indicated.

$y = \pi^{2x-5}$, $x = 2$

$$\frac{dy}{dx} = \pi^{2x-5} \cdot \ln \pi \cdot 2$$

$$= \pi^{-1} \cdot \ln \pi \cdot 2 = \frac{2 \ln \pi}{\pi}$$

answer: _____

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

$$\ln y = \ln (\sec x)^x = x \ln (\sec x)$$

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

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

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

$$= (\sec x)^x (\ln (\sec x) + x \tan x)$$

answer: _____