3.8 3.9 **Review Problems**

① $y = e^{\cos^{-1}(\tan(2x))} + x$ Find $\frac{dy}{dx}$

② $y = 7^{\cos^{-1}\left(\frac{1}{x}\right)}$ Find $\frac{dy}{dx}$ → simplify to $\boxed{\dfrac{\ln(7)\cdot 7^{\cos^{-1}\left(\frac{1}{x}\right)}}{x\sqrt{x^2-1}}}$

③ $y = \ln(2x^4 + 7x)$ Find $\frac{dy}{dx}$

④ $y = e^{3x}\tan\sqrt{x}$ Find $\frac{dy}{dx}$

⑤ $y = \cot^{-1}\sqrt{x}$ Find $\frac{dy}{dx}$ → simplify to $\boxed{\dfrac{-1}{2\sqrt{x}(x+1)}}$

⑥ $y = \sec^{-1}(\tan(2x+1))$ Find $\frac{dy}{dx}$

⑦ $y = e^{\tan^{-1}(\sin^{-1}x)}$ Find $\frac{dy}{dx}$

⑧ $y = e^{\tan^{-1}(5x)} \cdot \ln(\csc^{-1}(2x))$ Find $\frac{dy}{dx}$

⑨ $y = \dfrac{\cos(e^x)}{\sin^{-1}\left(\frac{1}{x^2}\right)}$ Find $\frac{dy}{dx}$

⑩ $y = \ln(\ln(5x) + x)$ Find $\frac{dy}{dx}$

USE PROPERTIES OF LOGS FIRST — THEN FIND $\underline{\underline{f'(x)}}$

(11) $f(x) = \ln \sqrt[5]{\dfrac{(x-3)^4(x^2+1)}{(2x+5)^3}}$

(12) $f(x) = \log_7 (\sin(x) + 5)$

(13) $f(x) = \log(\sec^2 x)$ Simplify to $\boxed{\dfrac{2\tan x}{\ln(10)}}$

USE LOGARITHMIC DIFFERENTIATION TO FIND $\dfrac{dy}{dx}$

(14) $y = x^{\cos^{-1} x}$

(15) $y = (\sin x)^{(\sin^{-1} x)}$

INVERSE'S DERIVATIVE

(16) $f(x) = 3x^7 + 2x + 5$ and $g(x) = f^{-1}(x)$

A. Prove the inverse of f is also a function

B. Find $g'(10)$

(17) $f(x) = 2x + \sin x$

Find $\dfrac{d}{dx}\left[f^{-1}(\pi + 1)\right]$

(18) $xy + \sin^{-1}(y) = y^2$ Find $\frac{dy}{dx}$

Simplify to $\boxed{\dfrac{y\sqrt{1-y^2}}{2y\sqrt{1-y^2} - x\sqrt{1-y^2} - 1}}$

(19) $e^{xy} + \cos(y) = \ln(x+y)$ Find $\frac{dy}{dx}$

$\boxed{\text{DO NOT SIMPLIFY}}$

(20) Find the equation of the line tangent to

$e^y + y + 3x = 4$ at $x = 1$

(21) Develop the derivatives for

$y = \sin^{-1}x$ $y = \tan^{-1}x$

$y = \sec^{-1}x$ $y = e^x$

$y = \ln x$ $y = a^x$