SM 121 LESSON 31 2/3/5/8/23/26

SECTION 3.6 DERIVATIVES OF LOGARITHMIC FUNCTIONS

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② $f(x) = \ln(x^2+10)$ $\qquad \frac{d}{dx}\left(\ln g(x)\right) = \frac{g'(x)}{g(x)}$

$$\boxed{f'(x) = \frac{2x}{x^2+10}}$$

③ $f(x) = \sin(\ln x)$

$f'(x) = \cos u \frac{d}{dx} u \qquad u = \ln x \qquad u' = \frac{1}{x}$

$= \cos(\ln x)\left(\frac{1}{x}\right)$

$$\boxed{f'(x) = \frac{\cos(\ln x)}{x}}$$

⑤ $f(x) = \log_2(1-3x)$ $\qquad \frac{d}{dx}(\log_a x) = \frac{1}{x \ln a}$

$f'(x) = \frac{1}{u \ln 2} \cdot \frac{d}{dx} u \qquad u = 1-3x \qquad u' = -3$

$= \frac{1}{(1-3x)\ln 2}(-3)$

$$\boxed{f'(x) = \frac{-3}{\ln 2(1-3x)}}$$

LESSON 31

(8) $f(x) = \ln \sqrt[5]{x}$

$= \ln x^{1/5}$

$\frac{d}{dx}\left(\quad = \frac{1}{5}\ln x \right)$

$f'(x) = \frac{1}{5} \cdot \frac{1}{x}$

$\boxed{f'(x) = \frac{1}{5x}}$

(23) $y = x^2 \ln(2x)$

$y' = 2x\ln(2x) + \frac{2x^2}{2x}$

$\boxed{y' = 2x\ln 2x + x}$

$y'' = (2x)\left(\frac{2}{2x}\right) + (2)(\ln 2x) + 1$

$y'' = 2 + 2\ln 2x + 1$

$\boxed{y'' = 2\ln 2x + 3}$

(26) $y = \ln(\sec x + \tan x)$

$y' = \frac{\sec x \tan x + \sec^2 x}{\sec x + \tan x} = \frac{\sec x \cancel{(\sec x + \tan x)}}{\cancel{(\sec x + \tan x)}} = \boxed{\sec x}$

$\boxed{y'' = \sec x \tan x}$