27) $z = \tan\left(e^{-3\theta}\right) \iff \tan(f(x)) \Rightarrow \sec^2(f(x))\cdot f'(x)$

$z' = \sec^2\left(e^{-3\theta}\right)\cdot e^{-3\theta}\cdot(-3) = -3e^{-3\theta}\sec^2\left(e^{-3\theta}\right)$

$e^{f(x)}$

$e^{f(x)}\cdot f'(x)$

$\frac{d}{dx}\left(3x^2-7\right)^{10}$

$10(3x^2-7)^9\cdot 6x$

31) $k(\alpha) = \sin^5\alpha\cdot\cos^3\alpha$

$= (\sin\alpha)^5(\cos\alpha)^3$

$k'(\alpha) = \underbrace{(\sin\alpha)^5}_{\text{1st}}\cdot\underbrace{3(\cos\alpha)^2\cdot(-\sin\alpha)}_{\text{der 2nd}} + \underbrace{(\cos\alpha)^3}_{\text{2nd}}\cdot\underbrace{5(\sin\alpha)^4\cdot\cos\alpha}_{\text{der 1st}}$

$k'(\alpha) = -3\sin^6\alpha\cos^2\alpha + 5\sin^4\alpha\cos^4\alpha$

$k'(\alpha) = \sin^4\alpha\cos^2\alpha\left(-3\sin^2\alpha + 5\cos^2\alpha\right)$

Section 3.6 Derivative of ln x

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

$= \frac{f'(x)}{f(x)}$

ex: $\frac{d}{dx}\left(\ln(\cos x)\right) = \frac{-\sin x}{\cos x} = -\tan x$

f'(x)

f(x)

ex: $h(x) = \underbrace{x^3}_{\text{1st}}\underbrace{\ln(10x)}_{\text{2nd}}$

$h'(x) = \frac{x^3}{1}\cdot\frac{\cancel{10}}{\cancel{10}x} + \ln(10x)\cdot 3x^2 = x^2 + 3x^2\ln(10x)$

$= x^2\left(1+3\ln(10x)\right)$

ex: $f(x) = e^{\ln(e^{2x^2+3})} = e^{2x^2+3}$

$$f'(x) = e^{2x^2+3} \cdot 4x = 4xe^{2x^2+3}$$

ex: $f(x) = \dfrac{\ln x}{\sin x}$

$$f'(x) = \frac{\left(\sin x \cdot \frac{1}{x} - \ln x \cdot \cos x\right)}{\sin^2 x} \cdot \frac{x}{x}$$

$$f'(x) = \frac{\sin x - x \ln x \cos x}{x \sin^2 x}$$

5) $y = (\ln z)^{-1}$

$$y' = -1(\ln z)^{-2} \cdot \frac{1}{z}$$

$$\frac{-1}{z \ln^2 z}$$

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7) $f(x) = \ln(\underbrace{1-e^{-x}})$

$$f'(x) = \frac{e^{-x}}{1-e^{-x}} \cdot \frac{e^{x}}{e^{x}} = \frac{1}{e^x - 1}$$