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#44) $f(x) = \ln(x-1)$

$\Rightarrow f'(x) = \frac{1}{(x-1)}(1)$ ← "$\frac{1}{\text{STUFF}} \cdot (\text{deriv of stuff})$"

#46) $h(x) = \ln(2x^2+1)$

$\rightarrow h'(x) = \boxed{\frac{1}{(2x^2+1)}(4x)}$

#48) $y = x^2 \ln(x)$ ← product rule

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

#50) $y = \ln(\sqrt{x^2-4})$

Rewrite: $y = \ln(x^2-4)^{1/2}$

use properties of logs:

chain rule ← 2 OPTIONS

$y' = \boxed{\frac{1}{(x^2-4)^{1/2}}\left(\frac{1}{2}\right)(x^2-4)^{-1/2}}$

re-write: $y = \frac{1}{2}\ln(x^2-4)$

$\rightarrow y' = \boxed{\frac{1}{2}\frac{1}{(x^2-4)}(2x)}$

#52) $y = \ln\left(t(t^2+3)^3\right)$

$y' = \boxed{\frac{1}{(t(t^2+3)^3)} \cdot \left[(t)(3)(t^2+3)^2(2t) + (t^2+3)^3(1)\right]}$

product rule here

~~#53~~

(#52) alternate use properties of logs first

$y = \ln[t(t^2+3)^3]$

$\Rightarrow y = \ln(t) + \ln(t^2+3)^3$

$\Rightarrow y = \ln(t) + 3\ln(t^2+3)$

$\Rightarrow y' = \boxed{\frac{1}{t} + 3\frac{1}{(t^2+3)}(2t)}$

(#54) $f(x) = \ln\left(\frac{2x}{x+3}\right)$

$\Rightarrow f'(x) = \boxed{\frac{1}{\left(\frac{2x}{x+3}\right)}\left(\frac{(x+3)(2) - (2x)(1)}{(x+3)^2}\right)}$

quotient rule

(#55) alternate

use properties of logs first

$\Rightarrow f(x) = \ln\left(\frac{2x}{x+3}\right)$

$\Rightarrow f(x) = \ln(2x) - \ln(x+3)$

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

(#56) $h(t) = \frac{\ln(t)}{t^3+5}$ quotient rule

$\Rightarrow h'(t) = \frac{(t^3+5)\left(\frac{1}{t}\right) - (\ln(t))(3t^2)}{(t^3+5)^2}$

(58) $y = \ln(\ln(x))$

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

(60) $y = \ln\sqrt[3]{\frac{x-1}{x+1}}$

$= \ln\left(\frac{x-1}{x+1}\right)^{1/3}$

$= \frac{1}{3}\ln\left(\frac{x-1}{x+1}\right) \Rightarrow y' = \frac{1}{3}\cdot\frac{1}{\left(\frac{x-1}{x+1}\right)}\cdot\left(\frac{(x+1)(1)-(x-1)(1)}{(x+1)^2}\right)$

(62) $f(x) = \ln\left(x+\sqrt{4+x^2}\right)$

$= \ln\left(x+(4+x^2)^{1/2}\right)$

$\Rightarrow f'(x) = \frac{1}{\left(x+(4+x^2)^{1/2}\right)}\cdot\left(1+\frac{1}{2}(4+x^2)^{-1/2}(2x)\right)$