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EXAMPLE
IN CLASS
LOGARITHMIC DIFF.
SOLUTIONS

$$y = \log_5 \left(\sqrt[3]{\frac{12x \cos^2 x}{(5x+3)(\tan^3 x)}} \right)$$

Simplify using properties of logs

$$y = \frac{1}{3} \left[\log_5 [12x] + \log_5 [\cos^2 x] - \log_5 [5x+3] - \log_5 [\tan^3 x] \right]$$

$$y = \frac{1}{3} \left[\log_5 (12x) + 2 \log_5 (\cos x) - \log_5 (5x+3) - 3 \log_5 (\tan x) \right]$$

$$\frac{1}{y} y' = \frac{1}{3} \left[\frac{1}{\ln 5} \frac{1}{12x} (12) + \frac{2}{\ln 5} \frac{1}{\cos x} (-\sin x) - \frac{1}{\ln 5} (5) - \frac{3}{\ln 5} \frac{1}{\tan x} \sec^2 x \right]$$

$$\frac{1}{y} y' = \frac{1}{3} \left[\frac{1}{\ln 5 x} - \frac{2 \tan x}{\ln 5} - \frac{1}{\ln 5 x} - \frac{3 \sec^2 x}{\ln 5 \tan x} \right]$$

$$y' = \frac{1}{3} \log_5 \left(\sqrt[3]{\frac{12x \cos^2 x}{(5x+3)(\tan^3 x)}} \right) \left[\frac{1}{\ln 5 x} - \frac{2 \tan x}{\ln 5} - \frac{1}{\ln 5 x} - \frac{3 \sec^2 x}{\ln 5 \tan x} \right]$$