$\frac{\partial}{\partial x} \ln(x) = \frac{x'}{x}$

Math 1a
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## Section 3.6

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1. Differentiate the following.

a) $f(x) = \sin(\ln x^2)$

$\cos(\ln x^2) \cdot \frac{2x}{x^2}$

b) $y = \ln(x^2 \tan(3x))$

$\frac{2x\tan(3x) + x^2 \sec^2(3x) \cdot 3}{x^2}$

c) $h(x) = \cos x \ln(x^2 + 6)$ is that $\cos(x)\ln(x^2+6)$?

$(-\sin(x))\ln(x^2+6) + \cos(x)\frac{2x}{x^2+6} = \frac{2x\cos x}{x^2+6} - \sin(x)\ln(x^2+6)$

d) $g(x) = \frac{(3x-2)^5}{\sqrt{x^2+8}}$ log is easier

$\ln(g) = 5\ln(3x-2) - \frac{1}{2}\ln(x^2+8)$

take derivative

$\frac{g'}{g} = \frac{5 \cdot 3}{3x-2} - \frac{1}{2} \cdot \frac{2x}{x^2+8} = \frac{15}{3x-2} - \frac{2x}{2(x^2+8)}$

$g' = \boxed{\frac{(3x-2)^5}{\sqrt{x^2+8}}}\left(\frac{15}{3x-2} - \frac{x}{x^2+8}\right)$

e) $y = (\tan x)^x$ ln again?

$\ln(y) = \ln(\tan x)\, x$

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

$y' = \left[\frac{x\sec^2(x)}{\tan(x)} + \ln(\tan x)\right] \cdot \tan^x x$

**2.** Find the equation of the tangent line to the curve $y = \ln(x^2 - 8x + 1)$ at the point $(8, 0)$.

$\frac{\partial y}{\partial x} = \frac{2x-8}{x^2-8x+1}$

$x = 8$

$\frac{2(8)-8}{(8)^2 - 8(8)+1} \rightarrow \frac{8}{\cancel{64-64}+1} = 8$

$y = 8(x-8)$