$L)\quad y=\sqrt{3x}\csc x$

$M)\quad y=3x\sqrt{\csc x}$

N) Find y″ if $y=9\cot\left(\dfrac{x}{3}\right)$

$$y=9\cot\left(\tfrac{1}{3}x\right)$$

$$y'=9\left(-\csc^2\left(\tfrac{1}{3}x\right)\right)\cdot\tfrac{1}{3}$$

$$\boxed{y'=-3\left[\csc\left(\underset{\uparrow}{\tfrac{1}{3}x}\right)\right]^2}$$

$$y''=-6\Big[$$

$$y''=-6\left(\csc\left(\tfrac{1}{3}x\right)\right)^1\cdot\left(-\csc\left(\tfrac{1}{3}x\right)\cot\left(\tfrac{1}{3}x\right)\right)\cdot\tfrac{1}{3}$$

$$\boxed{=2\csc^2\left(\tfrac{1}{3}x\right)\cot\left(\tfrac{1}{3}x\right)}$$

Suppose that functions f and g and their derivatives have the following values at x = 2 and x = 3.

x	f(x)	g(x)	$f'(x)$	$g'(x)$
2	8	2	1/3	-3
3	3	-4	2π	5

Evaluate the derivatives with respect to x

A) $2f(x)$ at $x=2$

B) $f(x)+g(x)$ at $x=3$

Product Rule

C) $f(x)g(x)$ at $x=3$

$\cancel{f'(x)g'(x)}$

$f(x)\cdot g'(x)+g(x)\cdot f'(x)$

$f(3)\cdot g'(3)+g(3)\cdot f'(3)$

$(3)(5)+(-4)(2\pi)$

$15-8\pi$

Quotient Rule

D) $\dfrac{f(x)}{g(x)}$ at $x=2$

$$\frac{g(x)\cdot f'(x)-f(x)g'(x)}{[g(x)]^2}$$

$$\frac{g(2)\cdot f'(2)-f(2)g'(2)}{[g(2)]^2}$$

$$\boxed{\frac{(2)\left(\frac{1}{3}\right)-(8)(-3)}{2^2}}$$

$$\frac{\cancel{(3)}\frac{2}{\cancel{3}}+24(3)}{4(3)}=\frac{2+72}{12}$$

$$\frac{74}{12}=\frac{37}{6}$$

$y=\sin(5x)$

$y'=\cos(5x)\cdot 5$

$\sin(5x)$

E) $f(g(x))$ at $x=2$

$f'(g(x))\cdot g'(x)$

$f'(g(2))\cdot g'(2)$

$f'(2)\cdot g'(2)$

$\frac{1}{3}\cdot(-3)$

F) $\sqrt{f(x)}$ at $x=2$

$\frac{d}{dx}\left[(f(x))^{1/2}\right]$

$\frac{1}{2}\left[f(x)\right]^{-1/2}\cdot f'(x)$

Alg

$\frac{1}{2\sqrt{f(x)}}\cdot f'(x)$

G) $\frac{1}{g^2(x)}$ at $x=3$

$\frac{d}{dx}\left[(g(x))^{-2}\right] = -2(g(x))^{-3}\cdot g'(x) = \frac{-2g'(x)}{[g(x)]^3}$

F) $\sqrt{f^2(x)+g^2(x)}$ at $x=2$

$\frac{d}{dx}\left([f(x)]^2+[g(x)]^2\right)^{1/2}$

$\frac{1}{2}\left([f(x)]^2+[g(x)]^2\right)^{-1/2}\cdot\left[2f(x)\cdot f'(x)+2g(x)\cdot g'(x)\right]$

$\frac{f(x)\cdot f'(x)+g(x)\cdot g'(x)}{\sqrt{f^2(x)+g^2(x)}}$