Put your name double the times, that's the rule: Key

AP Calculus AB: 3.13 Double Chain Rule

Find $f'(x)$ for each of the following functions

1. $f(x) = tan^4(3x^5 - x + 5)$

$f'(x) = 4\tan^3(3x^5-x+5)\sec^2(3x^5-x+5)(15x^4-1)$

$f' = (60x^4-4)\tan^3(3x^5-x+5)\sec^2(3x^5-x+5)$

2. $f(x) = \sqrt{\csc(5x)} = \csc^{1/2}(5x)$

$f' = \frac{1}{2}\csc^{-1/2}(5x)\cdot\csc(5x)\cot(5x)\cdot 5$

$= \dfrac{5\csc(5x)\cot(5x)}{2\sqrt{\csc(5x)}}$

3. $f(x) = sec^3(e^{4x^2})$

$f' = 3\sec^2(e^{4x^2})\cdot\sec(e^{4x^2})\tan(e^{4x^2})\cdot 8xe^{4x^2}$

$= 24xe^{4x^2}\sec^3(e^{4x^2})\cdot\tan(e^{4x^2})$

~~4. $f(x) = \cos(\sqrt{\ln(7x)})$~~

5. Evaluate $\lim_{h\to 0}\frac{4(x+h)^3 - sin^3(6(x+h)^2) - (4x^3 - sin^3(6x^2))}{h}$

$12x^2 - 3\sin^2(6x^2)\cdot\cos(6x^2)\cdot 12x$

$12x\left[x - 3\sin^2(6x^2)\cos(6x^2)\right]$

6. Find the instantaneous rate of change of the function $g(x) = sin^2(4x)$ at $x = \frac{\pi}{3}$

$g'(x) = 2\sin(4x)\cdot\cos(4x)\cdot 4$

$8\sin(4x)\cos(4x)$

$g'(\frac{\pi}{3}) = (\frac{8}{1})(\sin(\frac{4\pi}{3}))(\cos(\frac{4\pi}{3})) = (\frac{8}{1})(\frac{-\sqrt{3}}{2})(\frac{-\sqrt{1}}{2}) = \frac{8\sqrt{3}}{4} = \boxed{2\sqrt{3}}$