AP Calculus AB

Chain Rule Practice

HW 2-8

Name: Key

Differentiate.

1) $y = (-5x^3-3)^3$

$y' = (-15x^2)(3)(-5x^3-3)^2$

$\boxed{y' = (-45x^2)(-5x^3-3)^2}$

2) $y = \sqrt{-2x^2+1}$

$y = (-2x^2+1)^{1/2}$

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

$y' = (-2x)(-2x^2+1)^{-1/2}$

$\boxed{y' = \dfrac{-2x}{(-2x^2+1)^{1/2}}}$

3) $f(x) = \sqrt[3]{-2x^4+5}$

$f(x) = (-2x^4+5)^{1/3}$

$f'(x) = (-8x^3)(\frac{1}{3})(-2x^4+5)^{-2/3}$

$f'(x) = (-\frac{8}{3}x^3)(-2x^4+5)^{-2/3}$

$\boxed{f'(x) = \dfrac{-8x^3}{3(-2x^4+5)^{2/3}}}$

4) $y = (-x^4-3)^{-2}$

$y' = (-4x^3)(-2)(-x^4-3)^{-3}$

$y' = (8x^3)(-x^4-3)^{-3}$

$\boxed{y' = \dfrac{8x^3}{(-x^4-3)^3}}$

5) $y = (3x^3+1)(-4x^2-3)^4$

$y' = (9x^2)(-4x^2-3)^4 + (3x^3+1)(-8x)(4)(-4x^2-3)^3$

$\boxed{y' = (9x^2)(-4x^2-3)^4 - 32x(3x^3+1)(-4x^2-3)^3}$

6) $f(x) = \dfrac{(x^3+4)^5}{3x^4-2}$

$f'(x) = \dfrac{(3x^4-2)(3x^2)(5)(x^3+4)^4 - (x^3+4)^5(12x^3)}{(3x^4-2)^2}$

$\boxed{f'(x) = \dfrac{15x^2(3x^4-2)(x^3+4)^4 - (x^3+4)^5(12x^3)}{(3x^4-2)^2}}$

7) $y = (3x-1)(-3x^2-4)^{-3}$

$y' = (3)(-3x^2-4)^{-3} + (3x-1)(-6x)(-3)(-3x^2-4)^{-4}$

$\boxed{y' = \dfrac{3}{(-3x^2-4)^3} + \dfrac{18x(3x-1)}{(-3x^2-4)^4}}$

8) $f(x) = \left(\dfrac{5x^5-3}{-3x^3+1}\right)^3$

$\boxed{f'(x) = \left(\dfrac{(-3x^3+1)(25x^4) - (5x^5-3)(-9x^2)}{(-3x^3+1)^2}\right)(3)\left(\dfrac{5x^5-3}{-3x^3+1}\right)^2}$

9) $f(x) = \left(\dfrac{x^5+4}{x^2-5}\right)^{1/5}$

$\boxed{f'(x) = \left(\dfrac{(x^2-5)(5x^4) - (x^5+4)(2x)}{(x^2-5)^2}\right)\left(\dfrac{1}{5}\right)\left(\dfrac{x^5+4}{x^2-5}\right)^{-4/5}}$

- Find the equation of the normal line to $y = (2x-6)^3$ where $x = 1$. ← x_1

$y = (2(1)-6)^3$

$y = -64$

$y' = 2(3)(2x-6)^2$

$y' = 6(2x-6)^2$ → plug in 1: $6(2-6)^2 = 96$ → $\perp$ slope: $-\frac{1}{96}$

$\boxed{y + 64 = -\frac{1}{96}(x-1)}$