9/20/18

Review: $f(x) = x^7$ $\quad f(x) = \frac{1}{x^5} = x^{-5}$ $\quad f(x) = 4\sqrt{x} = 4x^{1/2}$

$f'(x) = 7x^6$ $\quad f'(x) = -5x^{-6} = \frac{-5}{x^6}$ $\quad f'(x) = 2x^{-1/2} = \frac{2}{\sqrt{x}}$

<u>Chain Rule</u> - use when you have a composition of functions

$$\frac{d}{dx}\left[f(g(x))\right] = f'(g(x)) \cdot g'(x)$$

Find the derivative:

$g(x) = x^3 + 2x^2 + 3x + 1$
$f(x) = x^7$
$p(x) = f(g(x))$

1. $p(x) = (x^3 + 2x^2 + 3x + 1)^7$

$p'(x) = 7(x^3 + 2x^2 + 3x + 1)^6 (3x^2 + 4x + 3)$

2. $y = \frac{1}{(x^2-1)^5} = (x^2-1)^{-5}$

$y' = -5(x^2-1)^{-6}(2x) = \frac{-10x}{(x^2-1)^6}$

3. $g(x) = 4\sqrt{3-x^2} = 4(3-x^2)^{1/2}$

$g'(x) = 2(3-x^2)^{-1/2}(-2x) = \frac{-4x}{\sqrt{3-x^2}}$

4. $y = \frac{10}{\sqrt[4]{2x+5}} = 10(2x+5)^{-1/4}$

$y' = 10 \cdot -\frac{1}{4}(2x+5)^{-\frac{5}{4}}(2) = \frac{-5}{(2x+5)^{5/4}}$

(5) $y = \left(2 - \frac{1}{x}\right)^5 \longrightarrow x^{-1}$

$y' = 5\left(2 - \frac{1}{x}\right)^4 \cdot \left(0 - -1 \cdot x^{-2}\right) = \dfrac{5\left(2 - \frac{1}{x}\right)^4}{x^2}$

(6) $f(x) = \sin(4x)$

$f'(x) = \cos(4x) \cdot 4 = 4\cos(4x)$

(7) $f(x) = \sin^2 x = [\sin x]^2$

$f'(x) = 2[\sin x]^1 \cdot \cos x = \sin 2x$

(8) $f(x) = \sin^2(4x) = [\sin(4x)]^2$

$f'(x) = 2[\sin(4x)]^1 \cdot \cos(4x) \cdot 4 = 8\sin 4x \cos 4x$

$4 \cdot \underbrace{2 \sin 4x \cos 4x}$

$4 \sin 8x$