3.5 Higher Derivatives

Note Title 10/22/2014

$$f'' = \frac{d}{dx}\left(f'(x)\right)$$

#1 find $f''(x)$ if $f(x) = 5x^4 - 3x^2$

$$f'(x) = 20x^3 - 6x$$

$$f''(x) = 60x^2 - 6$$

Notation for higher derivatives

$$y''', \; f'''(x), \; \frac{d^3y}{dx^3}, \; \frac{d^3}{dx^3}\left[f(x)\right]$$

$$y^{(4)}, \; f^{(4)}(x)$$

#2 find $\frac{d^2}{dt^2}\left(\frac{1}{t^3+1}\right)$

$$\frac{d}{dt} = \frac{(t^3+1)(0) - 1(3t^2)}{(t^3+1)^2}$$

$$= \frac{-3t^2}{(t^3+1)^2} \longleftarrow (t^3+1)^2 = t^6 + 2t^3 + 1$$

$$\frac{d^2}{dt^2} = \frac{(t^3+1)^2(-6t) - (-3t^2)(6t^5 + 6t^2)}{\left[(t^3+1)^2\right]^2}$$

$$= \frac{-6t(t^3+1)^2 + 3t^2(6t^2)(t^3+1)}{(t^3+1)^4}$$

cancel t^3+1

$$= \frac{-6t(t^3+1) + 18t^4(1)}{(t^3+1)^3}$$

$$= \frac{6t[-1(t^3+1) + 3t^3]}{(t^3+1)^3}$$

$$= \frac{6t[-t^3-1+3t^3]}{(t^3+1)^3}$$

$$= \frac{6t[2t^3-1]}{(t^3+1)^3}$$