**Power Rule, Product Rule, Quotient Rule**

If $n \neq 0$, then $\frac{d}{dx}\left[x^n\right] = nx^{n-1}$

$$\underline{\frac{d}{dx}\left[3x^2 - 5x^{17}\right]} = \frac{d}{dx}\left[3x^2\right] - \frac{d}{dx}\left[5x^{17}\right] = 3\frac{d}{dx}\left[x^2\right] - 5\frac{d}{dx}\left[x^{17}\right]$$

$$= 3 \cdot 2x - 5 \cdot 17x^{16}$$

$$= \underline{6x - 85x^{16}}$$

$$\frac{d}{dx}\left[x\sqrt{x}\right] = \frac{d}{dx}\left[x^1 \cdot x^{\frac{1}{2}}\right]$$

$$= \frac{d}{dx}\left[x^{1+\frac{1}{2}}\right] = \frac{d}{dx}\left[x^{\frac{3}{2}}\right] = \frac{3}{2}x^{\frac{3}{2}-1} = \frac{3}{2}x^{\frac{1}{2}}$$

$$\frac{d}{dx}\left[x^{-20}\right] = -20x^{-21}$$

Product Rule

$$(fg)' = f'g + fg'$$

$$(fgh)' = f'gh + fg'h + fgh'$$

$$(fgh)' = ((fg)h)' = (fg)'h + (fg)h'$$

$$= (f'g + fg')h + fgh'$$

$$= f'gh + fg'h + fgh'$$

Quotient Rule

$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$$

$$h(x) = \frac{3x+2}{7x-5} = \frac{f(x)}{g(x)} = \frac{f}{g} \Longrightarrow$$

$$\frac{gf' - fg'}{g^2}$$ Book

$f(x) = 3x+2 \Longrightarrow f'(x) = 3$

$g(x) = 7x-5 \Longrightarrow g'(x) = 7$

$$h'(x) = \frac{f'g - fg'}{g^2} = \boxed{\frac{3(7x-5) - (3x+2)(7)}{(7x-5)^2}} = \frac{21x - 15 - 21x - 14}{(\quad)^2}$$

STOP!

$$= \frac{-29}{(7x-5)^2}$$

$$\frac{d}{dx}\left[\frac{5x^3+7x^2-11}{\sqrt[3]{x}}\right]=\frac{d}{dx}\left[\frac{5x^3}{x^{1/3}}+\frac{7x^2}{x^{1/3}}-\frac{11}{x^{1/3}}\right]$$

$$=\frac{d}{dx}\left[5x^{3-\frac{1}{3}}+7x^{2-\frac{1}{3}}-11x^{-\frac{1}{3}}\right]$$

$$=\frac{d}{dx}\left[5x^{8/3}+7x^{\frac{5}{3}}-11x^{-\frac{1}{3}}\right]=\frac{40}{3}x^{\frac{5}{3}}+\frac{35}{3}x^{\frac{2}{3}}+\frac{11}{3}x^{-\frac{4}{3}}$$

2.3 #8 $g(x) = \dfrac{2x^2+6x+2}{\sqrt{x}} = 2x^{2-\frac{1}{2}} + 6x^{1-\frac{1}{2}} + 2x^{-\frac{1}{2}}$

$= 2x^{\frac{3}{2}} + 6x^{\frac{1}{2}} + 2x^{-\frac{1}{2}} \longrightarrow$

$g'(x) = \underbrace{3x^{\frac{1}{2}} + 3x^{-\frac{1}{2}} - 1x^{-\frac{3}{2}}}$ $=$ $\boxed{3\sqrt{x} + \dfrac{3}{\sqrt{x}} - \dfrac{1}{x\sqrt{x}}}$

Acceptable to me & WebAssign

**WebAssign says this, but accepts the other.**