5 pts on top of Tests.

§2.3 Power, Product, and Quotient Rules

$f(x) = x^5 \Rightarrow f'(x) = 5x^4$

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

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

$\lim_{x\to3}(2x) = 2\lim_{x\to3}(x) =$

$= 2(3) = 6$

Power Rule ✓

$\lim(f+g) = \lim f + \lim g$

$\lim(cf) = c\lim f$

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

$\frac{d}{dx}\left[x^5 + 2x\right]$

$= \frac{d}{dx}\left[x^5\right] + \frac{d}{dx}\left[2x\right]$

$= 5x^4 + 2\frac{d}{dx}\left[x\right]$

skip this

$= 5x^4 + 2$

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

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

---

Differentiate the following

$h(x) = (x^2+5x)(3x^3-7x^2) =$

$h = fg$

$h' = f'g + fg'$

$\boxed{M1}$ Just Power Rule

$h(x) = 3x^5 + 8x^4 - 35x^3$

$\Longrightarrow h'(x) = 15x^4 + 32x^3 - 105x^2$

$\boxed{M2}$ Use Product Rule $(fg)' = f'g + fg'$

$f = x^2+5x \qquad g = 3x^3-7x^2$

$f' = 2x+5 \qquad g' = 9x^2-14x$

$f'g + fg' = (2x+5)(3x^3-7x^2) + (x^2+5x)(9x^2-14x)$

STOP!

To confirm, we expand, even tho' we shouldn't unless we HAVE to.

$-35x^2$

$(fg)' = \underline{6x^4 - 14x^3 + 15x^3} + 9x^4 \underline{- 14x^3 + 45x^3 - 70x^2}$

$= 15x^4 + 32x^3 - 105x^2$

Product ✓

Quotient

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

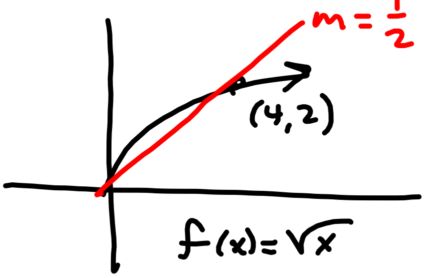
$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$$

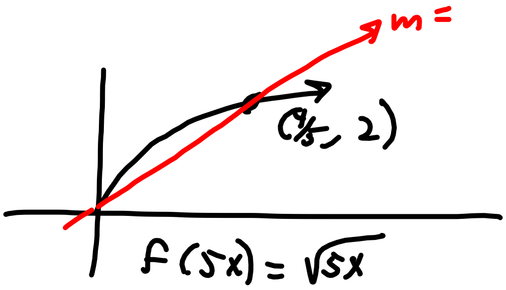
$$= \frac{(3x^2+10x)(5x^2+2x-1) - (x^3+5x^2-7)(10x+2)}{(5x^2+2x-1)^2}$$

$\boxed{\text{STOP!}}$

Skip Trig Derivatives, go to §2.5 on Chain Rule.

Recall: If (4,2) is on the graph of $f(x)=\sqrt{x}$, what's the corresponding point on $f(5x)=\sqrt{5x}$?





is 5 times steeper than $f(x)$.

$$\frac{2}{\frac{4}{5}} = \frac{2}{1}\cdot\frac{5}{4} = \frac{5}{2}$$

$$\frac{d}{dx}\left[f(5x)\right] = 5\,\frac{d}{d(5x)}\left[f(5x)\right]$$

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

$$\frac{d}{dx}\left[(x^2+7x)^{17}\right] = (2x+7)\left[17\,(x^2+7x)^{16}\right]$$

$$\frac{d}{du}\left[u^{17}\right] = 17u^{16}$$

§2.4 Trigs

§2.5 Chain Rule