Important Ideas:

Memory Tip for the Quotient Rule: "Heidi comes second."

$$\frac{d}{dx}\left(\frac{\text{Hi}}{\text{Lo}}\right)=\frac{\text{Lo dee Hi}-\text{Hi dee Lo}}{\text{Lo Lo}}$$

I'm Heidi!

From http://www.foxsports.com/buzzer/story/craziest-moments-in-nfl-history-the-heidi-game-081314

$\left(\frac{u}{v}\right)' = \frac{u'v - v'u}{v^2}$ Assume $v^2 \neq 0$ which means $v \neq 0$

↑ Division

the derivative of a quotient is a quotient

" " " " " has a numerator similar to the product rule with a minus sign instead of a plus sign.

Simplify first if possible.

Check Your Understanding

1. $p(t)=\dfrac{10t^2}{t^2+50}$ $\Rightarrow p'(t)=\dfrac{1000t}{(t^2+50)^2}$ see class notes

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

$y'(x) = \frac{d}{dx}3 + \frac{d}{dx}(2x^{-3/2})$

$= 0 + 2\cdot\left(-\frac{3}{2}\right)x^{-3/2-2/2}$

$= \boxed{-3x^{-5/2}}$ or $\boxed{\dfrac{-3}{x^{5/2}}}$

You CAN use the Quotient Rule, but in this case, simplifying first is the best choice!

TIP: Write this down each time you use it

3. $y(x)=\dfrac{3x^2}{4\ln x} = \dfrac{hi}{lo}$

$y'(x) = \dfrac{lo\,dee\,hi - hi\,dee\,lo}{lo\,lo} = \dfrac{4\ln x \frac{d}{dx}3x^2 - 3x^2\frac{d}{dx}4\ln x}{(4\ln x)^2} = \dfrac{(4\ln x)(6x) - 3x^2\left(\frac{4}{x}\right)}{(4\ln x)^2}$

$= \dfrac{24x\ln x - 12x}{(4\ln x)^2} = \boxed{\dfrac{12x(2\ln x-1)}{(4\ln x)^2}} = \dfrac{3\cdot 4x(2\ln x-1)}{4\cdot 4(\ln x)^2} = \boxed{\dfrac{3x(2\ln x-1)}{4\ln^2 x}}$

4. The table below gives values of f, g, f', and g' at selected x-values.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
-1	6	5	3	-2
1	3	-3	-1	2
3	1	-2	2	3

1 out"

Let $h(x)=\frac{f(x)}{g(x)}$. Find $h'(-1)$.

$h'(x) = \dfrac{lo\,dee\,hi - hi\,dee\,lo}{lo\,lo} = \dfrac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$

$h(-1) = \dfrac{(3)(5)-(6)(-2)}{3^2} = 3$

$g(-1) = 3$
$f'(-1) = 5$
$f(-1) = 6$
$g'(-1) = -2$