- Blue part is out of 76
- Green part is out of 26
→Total of 102 points possible
→Grade is out of 100

# Product and Quotient Rule

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

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

Lo-D-Hi minus Hi-D-Lo
Square the bottom
Do-Se-Do

Ex. $f(x) = x^2 e^x$

$$f'(x) = x^2 \cdot (e^x) + e^x \cdot (2x)$$

Ex. $f(x) = (3x^2 + 5x)3^x$

$$f'(x) = (3x^2 + 5x) \cdot (3^x \ln 3) + 3^x \cdot (6x + 5)$$

$f(x) = (x^2 + 1)(2x - 7)$

$$f'(x) = (x^2 + 1) \cdot 2 + (2x - 7) \cdot 2x$$

Ex. $f(x) = \dfrac{5x^2}{x^3+1}$

$$f'(x) = \frac{(x^3+1)\cdot 10x - 5x^2 \cdot 3x^2}{(x^3+1)^2} = \frac{10x^4 + 10x - 15x^4}{(x^3+1)^2}$$

$$= \frac{-5x^4 + 10x}{(x^3+1)^2}$$

Ex. $f(x) = \dfrac{1}{e^x + 1}$

$$f'(x) = \frac{(e^x + 1) \cdot 0 - 1 \cdot e^x}{(e^x + 1)^2} = \frac{-e^x}{(e^x + 1)^2}$$

Ex. $f(x) = \dfrac{1}{x^5} = x^{-5}$

$f'(x) = -5x^{-6}$

Ex. $f(x) = \dfrac{x^2}{4} = \dfrac{1}{4}x^2$

$f'(x) = \dfrac{1}{2}x$

Pract. $f(x) = \dfrac{e^x}{x^2}$

$f'(x) = \dfrac{x^2 \cdot e^x - e^x \cdot 2x}{(x^2)^2} = \dfrac{x e^x(x-2)}{x^4} = \dfrac{e^x(x-2)}{x^3}$

Pract. $f(x) = \dfrac{1-x^2}{1+x^2}$

$f'(x) = \dfrac{(1+x^2)(-2x) - (1-x^2)(2x)}{(1+x^2)^2} = \dfrac{-2x - 2x^3 - 2x + 2x^3}{(1+x^2)^2}$

$= \dfrac{-4x}{(1+x^2)^2}$

## Quotient Rule

A quotient of two functions you must differentiate,
Make Hi up high and Lo below, and do not hesitate:
Lo D Hi! - MINUS! - Hi D Lo! - OVER!
Over Lo! Over Lo-ho-ho-ho-ho-ho

Lo D Hi! - MINUS! - Hi D Lo! - OVER!
Lo squared: The Quotient Rule!