

2.3 Day 1 - Product and Quotient Rules

11/12/18

- Homework:
- 2.3A
 - Snowflake Project due tomorrow!
 - Quiz 2.3 -Monday 11/19

I LIKE TO THINK
OUTSIDE THE
QUADRILATERAL
PARALLELOGRAM.

Objective: Find the derivatives of functions using both product and quotient rules.

Do Now: Find the derivative of the given functions.

$$f(x) = (3x - 2x^2)(5 + 4x) \quad g(x) = \frac{3x + 2x^2 - 4x^3}{2x^2}$$

$$f(x) = 15x + 12x^2 - 10x^2 - 8x^3$$

$$f(x) = -8x^3 + 2x^2 + 15x$$

$$f'(x) = -24x^2 + 4x + 15$$

What is the Product Rule and when do we need it?

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

Let's try the *Do Now* again using the product rule...

$$f(x) = \overbrace{(3x - 2x^2)}^{f(x)} \cdot \overbrace{(5 + 4x)}^{g(x)}$$

$$f'(x) = \overbrace{(3 - 4x)}^{f'} \cdot \overbrace{(5 + 4x)}^g + \overbrace{(3x - 2x^2)}^f \cdot \overbrace{(4)}^{g'}$$

$$f'(x) = 15 - 8x - 16x^2 + 12x - 8x^2$$

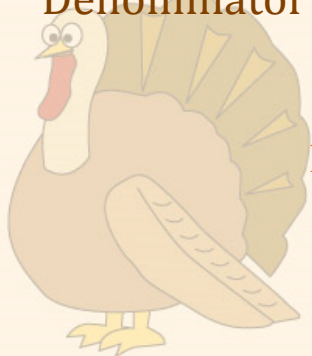
$$f'(x) = -24x^2 + 4x + 15$$

What is the Quotient Rule and when do we need it?

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

Things to note:

1. Pay attention to order in the numerator!
2. Don't forget the negative in the numerator.
3. Denominator is $g(x)$ squared NOT the derivative of $g(x)$.



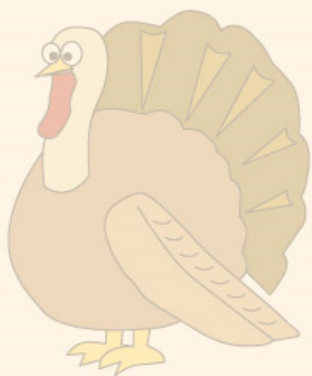
Let's try the *Do Now* again using the quotient rule...

$$g(x) = \frac{3x + 2x^2 - 4x^3}{2x^2}$$

You **MUST** memorize these!

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

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



Let's Practice Together

Find the derivative of each function.

$$y = 4\sqrt{x^3} \cdot \sin x$$

$$y = 4x^{3/2} \cdot \sin x$$

$$y' = 6x^{1/2} \sin x + 4x^{3/2} \cos x$$

$$y' = 2x^{1/2}(3 \sin x + 2x \cos x)$$

$$\frac{2x^{1/2}}{2x^{1/2}}$$

$$h(x) = \frac{4x^3}{3x-1}$$

$$h'(x) = \frac{12x^2(3x-1) - 4x^3(3)}{(3x-1)^2}$$

$$h'(x) = \frac{36x^3 - 12x^2 - 12x^3}{(3x-1)^2}$$

$$h'(x) = \frac{24x^3 - 12x^2}{(3x-1)^2} = \frac{12x^2(2x-1)}{(3x-1)^2}$$

Group Work

1) $f(x) = (5x^3 + 2x + 7)(3x^2 + 5)$

$$f'(x) = 75x^4 + 93x^2 + 42x + 10$$

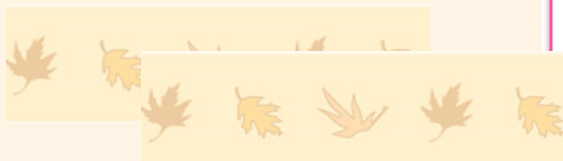
2) $y = 5x^3 \cos x$

$$y' = 15x^2 \cos x - 5x^3 \sin x$$

$$y' = 5x^2(3 \cos x - x \sin x)$$

3) $g(x) = \frac{4x^2 - 3x}{7x - 1}$

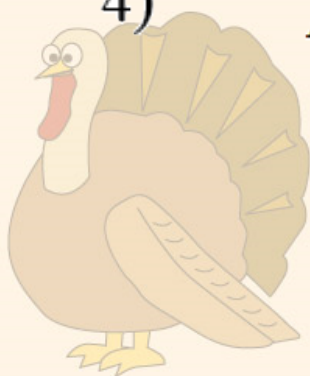
$$g'(x) = \frac{28x^2 - 8x + 3}{(7x - 1)^2}$$



4)

$$p(x) = \frac{x^2}{x^2 + 1}$$

$$p'(x) = \frac{2x}{(x^2 + 1)^2}$$

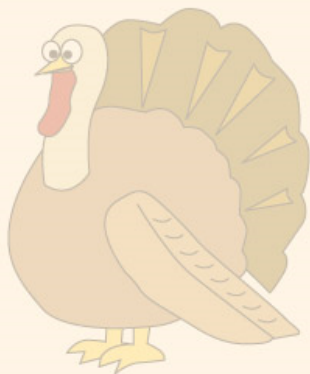


5) $y = \sqrt[5]{x^2} (2x^3 + 5)$



$$\frac{34x^3 + 10}{5x^{3/5}}$$

6) $h(x) = \frac{\sqrt{x}}{x+1}$



Closure

Find the derivative of the following function.

$$y = \frac{x^3 - 5x}{3}$$

Do you need to use the Quotient rule?

