Quotient Rule

Goal: • Can use quotient rule to take the derivative of quotient of polynomial and radical functions • Understands how to visualize quotient rule as an alternate to product rule
Terminology: • Quotient Rule
Reminder: • Quiz on Monday (all derivative rules covered thus far 2.1-2.5)

Thus far, we have three rules for taking derivatives of polynomial-type functions:

$$\frac{d}{dx}x^n = nx^{n-1}$$

$$\frac{d}{dx}(f \pm g) = \frac{df}{dx} \pm \frac{dg}{dx}$$

$$\frac{d}{dx}(f \cdot g) = f \cdot \frac{dg}{dx} + g \cdot \frac{df}{dx}$$

We illustrated product rule using area of a square. Without using your notes try to recreate the justification for product rule.

We want to explore the derivative of a quotient. Using a similar idea as product rule. Illustrate a rule for the derivative of a quotient.

$$\frac{d}{dx}\left(\frac{f}{g}\right) =$$

Example: If $f(x) = x^3 - 5x^2 + 8x$ and $g(x) = -2x^4 + 5x - 9$. Then determine

$$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right)$$

Practice: Determine $h'(1)$ given

$$h(x) = \frac{\left(\sqrt{x^3} - 3\right)(x^2 + 2)}{x - \frac{1}{x}}$$

Practice Problems: 2.5: # 1-3 (do what you need), 4-8

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In Class Evidence

4. If $f(2) = 3, f'(2) = 5, g(2) = -1$, and $g'(2) = -4$, find $\left(\frac{f}{g}\right)'(2)$.

5. Show that there are no tangents to the curve

$$y = \frac{x+2}{3x+4}$$

with positive slope.

8. If f is differentiable, find expressions for y' given the following functions.

b. $$y = \frac{f(x)}{x}$$

c. $$y = \frac{x}{f(x)}$$

9. Use Quotient Rule to deduce the Power Rule for the case of negative integer exponents. That is prove that

$$\frac{d}{dx}(x^{-n}) = -nx^{-n-1}$$