

Well..... Who might you be? Key Period: _____

AP Calculus AB: 3.10 Quotient Rule

Find the derivative of each of the following functions

1) $f(x) = \frac{6x^2}{2x-3}$

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

2) $f(x) = \frac{2e^{3x}}{4x^3}$

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

3) $f(x) = \frac{\sec(x)}{2\ln(x)}$

$$f'(x) = \frac{(2\ln(x))(\sec(x)\tan(x)) - \sec(x)(\frac{2}{x})}{(2\ln(x))^2}$$

$$= \frac{2\sec(x) \left[\ln(x)\tan(x) - \frac{1}{x} \right]}{4\ln(x)^2}$$

$$= \frac{\sec(x) \left[\ln(x)\tan(x) - \frac{1}{x} \right]}{2\ln(x)^2}$$

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

$$f'(x) = \frac{12x^3 - 30x^2}{(3x-5)^2}$$

5) Find $\frac{d^2y}{dx^2}$ of $y = \sec(x)$

$$y' = \underbrace{\sec(x)\tan(x)}_{\text{product}}$$

$$y'' = \sec^3(x) + \tan^2(x)\sec(x) = \sec(x) [\sec^2(x) + \tan^2(x)]$$

6) Find the point where the tangent line of the function $f(x) = \frac{x-1}{x+1}$ has a slope of $\frac{1}{2}$.

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

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

$$x = -3 \text{ and } 1$$

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

7) The function $f(x) = \frac{\ln(3x)}{g(x)}$ calculate the instantaneous rate of change at $x=2$. The graph of $g(x)$ is located to the right?

$$f'(x) = \frac{g(x) \left(\frac{1}{x} \right) - \ln(3x) g'(x)}{(g(x))^2}$$

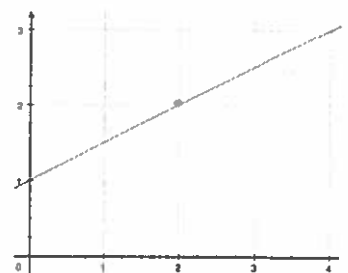
ask if you're confused about $\sqrt{6}$

$$g(2) = 2$$

$$g'(2) = \frac{1}{2}$$

$$f'(2) = \frac{2 \left(\frac{1}{2} \right) - \ln(6) \left(\frac{1}{2} \right)}{4} = \frac{1 - \ln(\sqrt{6})}{4}$$

$$\frac{1 - \ln(\sqrt{6})}{4}$$



8) Find the x-value where the two functions $f(x) = \frac{\ln(2x^3)}{3}$ and $g(x) = \sqrt{x}$ have parallel tangent lines. (Answer: $x=4$)

$$f'(x) = g'(x)$$

$$x = 4$$