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

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

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

Good Luck!   ~~ *Yuling (Yes)*   ⌣

1. (10 points) Find the domain and range of the function

$$f(x) = \frac{|x|}{x}$$

2. (10 points) Determine whether the function $f(x) = |x + 3|$ is one-to-one. If it is, find its inverse function.

3. (10 points) Describe the interval(s) on which the function $f(x)$ is continuous. If there are any discontinuities, determine whether they are removable.

$$f(x) = \frac{x + 4}{3x^2 - 12}$$

4. (30 points) Find the indicated limit or show it does not exist. If the limiting value is infinite, indicate whether it is ∞ or $-\infty$.

$$(a) \ \lim_{x \to -3^-} \frac{|x + 3|}{x + 3} \quad (b) \ \lim_{x \to -2^+} \frac{3}{x^2 - 4} \quad (c) \ \lim_{x \to 4} \frac{\sqrt{x + 5} - 3}{x - 4}$$

5. (20 points) Find an equation of the tangent line to the given graph at the given point.

$$(a) \ f(x) = \frac{(3x - 2)(6x + 5)}{2x - 3} \quad ; \text{at} \ (-1, -1) \quad (b) \ y^2(x^2 + y^2) = 2x^2 \quad ; \text{at} \ (1, 1)$$

6. (10 points) Find $f''(1)$, $f(x) = (x^3 - 2x)^3$

7. (10 points) Find the point(s), if any, at which the graph of

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

has a horizontal tangent line.