Name:
Teacher:
Period:
Due Date:

Be Good
Why>How>What

HW 2.2
Weekend

All of this can be referenced with proofs and additional examples on pg. 119 of your books.

The Product Rule

The product rule states that the derivative of the product of two functions f and g can be represented by:

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

Example:

Differentiate $y = (5x - 4)\sqrt{x}$

In this problem, we can set $f(x) = 5x - 4$ and $g(x) = \sqrt{x}$

$$f(x) = 5x - 4 \qquad f'(x) = 5$$
$$g(x) = \sqrt{x} \qquad g'(x) = \frac{1}{2\sqrt{x}}$$

If $y = f(x)g(x)$ then $y' = f(x)g'(x) + g(x)f'(x) = (5x - 4)\left(\frac{1}{2\sqrt{x}}\right) + \left(\sqrt{x}\right)(5)$

Simplified:

$$y' = \frac{5x - 4}{2\sqrt{x}} + 5\sqrt{x}$$

$$y' = \frac{5x - 2}{\sqrt{x}}$$

The Quotient Rule

The quotient rule states that the derivative of the quotient of two functions f and g can be represented by:

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

Example:

Differentiate $y = \frac{x^2-4}{x^3-3x^2}$

In this problem, we can set $f(x) = x^2 - 4$ and $g(x) = x^3 - 3x^2$

$$f(x) = x^2 - 4 \qquad f'(x) = 2x$$
$$g(x) = x^3 - 3x^2 \qquad g'(x) = 3x^2 - 6x$$

$$y = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2} = \frac{(x^3 - 3x^2)(2x) - (x^2 - 4)(3x^2 - 6x)}{(x^3 - 3x^2)^2}$$

Practice

Differentiate

1.) $f(x) = \sqrt{x}(x^2 + 8)$

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