Stewart Section 3.2

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The Product Rule

Suppose f and g are differentiable functions. The the derivative of the **product** $(f \cdot g)(x)$ is given by

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

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The equivalent formula using the f' notation is less cluttered:

$$(fg)' = fg' + gf'$$

The Quotient Rule

Suppose f and g are differentiable functions. The the derivative of the **quotient** $(f/g)(x)$ is given by

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

(recall that the definition of $f(x)/g(x)$ assumes $g(x) \neq 0$).

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Again, the equivalent formula using the f' notation is less cluttered:

$$(f/g)' = \frac{gf' - fg'}{g^2}$$

Using the Formulas

We now have formulas for sums, products, differences, quotients, powers, and roots of differentiable functions.

In principle, we can now find the derivative of any algebraic function by breaking it down into components and applying the appropriate differentiation rule.