L'Hôpital's Rule, Version 1

$$\lim_{x \to a} \frac{f(x)}{g(x)} = \lim_{x \to a} \frac{f'(x)}{g'(x)}$$

provided $f(a) = g(a) = 0$ and the right hand limit exists.

This version of l'Hôpital's rule is similar to but better than the rule we just derived; it lets us get rid of the restriction $g'(a) \neq 0$.

This is practically the same thing we did in computing $\lim_{x \to 1} \frac{x^{10} - 1}{x^2 - 1}$. First we took the derivative of the numerator and denominator separately (do *not* apply the quotient rule here!)

$$\lim_{x \to 1} \frac{x^{10} - 1}{x^2 - 1} = \lim_{x \to 1} \frac{10x^9}{2x}.$$

Next, we found the limit as x approaches 1:

$$\lim_{x \to 1} \frac{10x^9}{2x} = \frac{10}{2} = 5.$$

Instead of evaluating $\frac{x^{10} - 1}{x^2 - 1}$, we took derivatives and instead evaluated $\frac{10x^9}{2x}$ which is much simpler. This is typical of l'Hôpital's rule.