l'Hôspital's Rule

Suppose that f and g are differentiable and $g'(x) \neq 0$.

Also suppose that $\lim_{x \to a} f(x) = 0$ and $\lim_{x \to a} g(x) = 0$

Then $\lim_{x \to a} \frac{f(x)}{g(x)} = \lim_{x \to a} \frac{f'(x)}{g'(x)}$, if the limit on the right side exists (or is $\pm\infty$).

Also, if $\lim_{x \to a} f(x) = \pm\infty$ and $\lim_{x \to a} g(x) = \pm\infty$,

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

In summary, the following are **indeterminate** forms.

$$\frac{0}{0},\ \frac{\infty}{\infty},\ \infty - \infty,\ 0 \cdot \infty,\ 0^0,\ \infty^0,\ 1^\infty$$

The following are **not** indeterminate forms.

$$\frac{0}{\infty},\ \frac{\infty}{0},\ 0^\infty,\ \infty \cdot \infty,\ \infty + \infty,\ -\infty - \infty$$