L'Hopital's rule

L'Hôpital's Rule for $\boxed{\frac{0}{0}}$ = $\boxed{\frac{\infty}{\infty}}$ Indeterminate form

Suppose $\lim f(x) = \lim g(x) = 0$. Then

1. If $\lim \dfrac{f'(x)}{g'(x)} = L$, then $\boxed{\lim \dfrac{f(x)}{g(x)} = \lim \dfrac{f'(x)}{g'(x)}} = L$.
2. If $\lim \dfrac{f'(x)}{g'(x)}$ tends to $+\infty$ or $-\infty$ in the limit, then so does $\dfrac{f(x)}{g(x)}$.

$$\lim_{x\to 0} \frac{\sin x}{x} = \lim_{x\to 0} \frac{\cos x}{1} = \frac{\cos 0}{1} = 1$$

$$\frac{\sin 0}{0} = \frac{0}{0}$$

$$\lim_{x\to 5} \frac{x^2 - 25}{x - 5} = \lim_{x\to 5} \frac{2x}{1} = 2\cdot 5 = 10$$

$$\frac{0}{0}$$

$$\frac{(x+5)\cancel{(x-5)}}{\cancel{x-5}} = 5+5 = 10$$

$$\lim_{x\to\infty} \frac{2x + 3}{x^2 + 2x - 1} = \lim_{x\to\infty} \frac{2}{2x+2} = 0$$