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### 0.1 L'Hôpital's rule

#### 0.1.1 L'Hôpital's rule

If there are two functions which are both tend to 0 at a limit, calculating the limit of their divisor is hard. We can use L'Hopital's rule.

We want to calculate:

$$\lim_{x \rightarrow c} \frac{f(x)}{g(x)}$$

This is:

$$\lim_{x \rightarrow c} \frac{f(x)}{g(x)} = \lim_{x \rightarrow c} \frac{\frac{f(x)-0}{\delta}}{\frac{g(x)-0}{\delta}}$$

If:

$$\lim_{x \rightarrow c} f(x) = \lim_{x \rightarrow c} g(x) = 0$$

Then

$$\lim_{x \rightarrow c} \frac{f(x)}{g(x)} = \lim_{x \rightarrow c} \frac{\frac{f(x)-f(c)}{\delta}}{\frac{g(x)-f(c)}{\delta}}$$

$$\lim_{x \rightarrow c} \frac{f(x)}{g(x)} = \frac{f'(x)}{g'(x)}$$