L' Hospital L Hôpital

- $\lim_{x \to a} f(x) = \lim_{x \to a} g(x) = 0$

OR

- $\lim_{x \to a} |g(x)| = \infty$

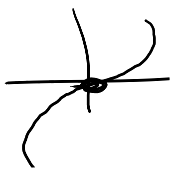
$$\lim_{x \to a} \frac{f(x)}{g(x)} = \lim_{x \to a} \frac{f'(x)}{g'(x)}$$

$\frac{0}{0}$ $\frac{\text{anything}}{\pm\infty}$

$\frac{0}{0}$

$$\lim_{x \to 0} \frac{\arcsin x}{x} \underset{0/0}{\overset{L'H}{=}} \lim_{x \to 0} \frac{\frac{1}{\sqrt{1-x^2}}}{1} = \frac{\frac{1}{\sqrt{1-0^2}}}{1} = \underline{1}$$

$$\frac{\arcsin 0}{0} = \frac{0}{0}$$



$$\frac{\text{anything}}{\infty}$$

$$\lim_{x\to\infty} \frac{3x^2+x-1}{-2x^2-7} \underset{\frac{\text{anything}}{\pm\infty}}{\overset{L'H}{=}} \lim_{x\to\infty} \frac{6x+1}{-4x}$$

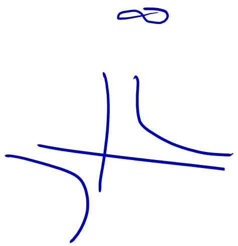
$$\lim_{x\to\infty} -4x = -\infty$$

$$\lim_{x\to\infty} -2x^2-7 = -\infty$$

$$\underset{\frac{\text{anything}}{\pm\infty}}{\overset{L'H}{=}} \lim_{x\to\infty} \frac{6}{-4} = \underline{\underline{-\frac{3}{2}}}$$

x^{-1}

$$\lim_{x\to 0^+} \frac{e^{-1/x}}{x} \underset{\frac{0}{0}}{\overset{L'H}{=}} \lim_{x\to 0^+} \frac{e^{-1/x}\cdot(-1)\cdot(-1)\,x^{-2}}{1} =$$



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

$$\lim_{x \to 0} \frac{1}{x} - \frac{1}{e^x - 1} = \qquad \frac{f}{g}$$

$$1 - 1 = 0$$

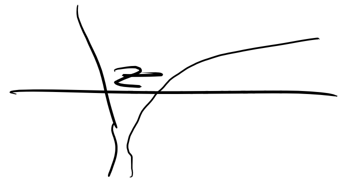
$$\lim_{x \to 0} \frac{e^x - 1 - x}{x(e^x - 1)} \underset{\frac{0}{0}}{\overset{LH}{=}} \lim_{x \to 0} \frac{e^x - 1}{(e^x - 1) + xe^x} =$$

$$1 - 1 \quad + 0 = 0$$

$$\underset{\frac{0}{0}}{\overset{LH}{=}} \lim_{x \to 0} \frac{e^x}{e^x + e^x + xe^x} = \frac{1}{1 + 1 + 0} = \underline{\underline{\frac{1}{2}}}$$

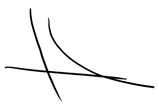
$$\lim_{x\to 0+} \underset{\substack{\downarrow \\ 0}}{x}\ \underset{\substack{\downarrow \\ -\infty}}{\ln x}$$

$$\frac{f}{g}$$



$$\lim_{x\to 0+} \frac{\ln x}{\frac{1}{x}} \overset{L'H}{=} \lim_{x\to 0+} \frac{\frac{1}{x}}{-\frac{1}{x^2}} =$$

$$\frac{\text{anything}}{\pm\infty}$$



$$= \lim_{x\to 0+} -\frac{x^2}{x} = \lim_{x\to 0+} -x = \underline{\underline{0}}$$

$$\lim_{x\to 0+} \frac{x}{\frac{1}{\ln x}} \overset{L'H}{\underset{\frac{0}{0}}{=}} \lim_{x\to 0+} \frac{1}{-1(\ln x)^{-2}\cdot\frac{1}{x}}$$

$$(\ln x)^{-1}$$

$$\lim_{x\to 0+} \frac{x}{-\frac{1}{\ln^2 x}}$$

$$\lim_{x \to 0+} x^x = \lim_{x \to 0+} e^{x \ln x} = e^0$$

$$0^0 \qquad \boxed{a^b = e^{b \ln a}} = 1$$

$$\lim_{x \to 0+} x \ln x = 0$$