L'Hôpital Flowchart

To find $\lim_{x\to a} f(x)$ ...

Indeterminate Differences

If $\lim_{x\to a} f(x) = \lim_{x\to a}[g(x)-h(x)] = \infty - \infty$

Find a common denominator of $g(x)$ and $h(x)$ so that $\lim_{x\to a} f(x)$ is expressed as the limit of one combined fraction.

Indeterminate Products

If $\lim_{x\to a} f(x) = \lim_{x\to a} g(x)h(x) = 0\cdot\infty$ or $0\cdot-\infty$

Option 1:
Let $\lim_{x\to a} f(x) = \lim_{x\to a} \frac{g(x)}{h^{-1}(x)}$.

Option 2:
Let $\lim_{x\to a} f(x) = \lim_{x\to a} \frac{h(x)}{g^{-1}(x)}$.

Indeterminate Powers

If $\lim_{x\to a} f(x) = \lim_{x\to a}[g(x)]^{h(x)} = 0^0, \infty^0, 1^\infty,$ or $1^{-\infty}$

Let $\lim_{x\to a} f(x) = \lim_{x\to a} e^{\ln[g(x)]^{h(x)}} = \lim_{x\to a} e^{h(x)\cdot\ln[g(x)]} = e^{\lim_{x\to a} h(x)\ln[g(x)]}$.

Let $u = \lim_{x\to a} h(x)\ln[g(x)]$.

u is an indeterminate product.

After solving u, remember to plug it back into e^u, so $\lim_{x\to a} f(x) = e^u$.

L'Hôpital's Rule

If $\lim_{x\to a} f(x) = \lim_{x\to a} \frac{v(x)}{w(x)} = \frac{0}{0}, \frac{\infty}{\infty},$ or $-\frac{\infty}{\infty}$

$\lim_{x\to a} f(x) = \lim_{x\to a} \frac{v(x)}{w(x)} \overset{LH}{=} \lim_{x\to a} \frac{v'(x)}{w'(x)}$

* note: do NOT apply quotient rule to $\frac{v(x)}{w(x)}$. Take $v'(x)$ and $w'(x)$ separately.

Still indeterminate

Got an answer that is not indeterminate

Done!

Got an answer that is not indeterminate, but we were solving for u

Done - answer is e^u