

L'Hopital's Rule

Mathematics

Resolving an indeterminate limit by differentiating top and bottom separately.

For a $0/0$ or ∞/∞ limit with g' nonzero nearby, $\lim f/g$ equals $\lim f'/g'$ whenever that second limit exists.

$$\lim f(x)/g(x) = \lim f'(x)/g'(x)$$

$$\lim_{x \rightarrow 0} \sin x / x$$

$\cos 0 \div 1$.

1

$$\lim_{x \rightarrow \infty} \ln x / x$$

$(1/x) \div 1 \rightarrow 0$.

0

$$\lim_{x \rightarrow 0} (e^x - 1)/x$$

One application.

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THE COMMON MISTAKE

✗ Differentiating f/g with the quotient rule

✓ Differentiating f and g separately

The rule replaces the ratio of two functions with the ratio of their derivatives. It is not the quotient rule and never was.

Check the form first. Applied to a limit that is not $0/0$ or ∞/∞ , the rule returns a confident wrong answer.