

Infinity is Not a Number

Frequently we treat infinity as a number: plugging it into equations and leaving out the whole limit notation. I want to stress that this is just a shorthand notation: there is no number “infinity”; it is only a concept. The following table is a list of shorthand notations we tend to use, and what they actually mean:

What we say:	What we mean:	What the math says:
$\frac{1}{\infty} = 0$	$\lim_{n \rightarrow \infty} \frac{1}{n} = 0$	The bigger n gets, the closer $1/n$ gets to zero.
$\frac{1}{0} = \infty$	$\lim_{x \rightarrow 0^+} \frac{1}{x} = \infty$	As x gets closer to zero, $1/x$ gets arbitrarily big.
$e^\infty = \infty$	$\lim_{n \rightarrow \infty} e^n = \infty$	As n gets larger, e^n gets larger.
$e^{-\infty} = 0$	$\lim_{n \rightarrow \infty} e^{-n} = 0$	The bigger n gets, the closer e^{-n} gets to zero.
$\ln(\infty) = \infty$	$\lim_{n \rightarrow \infty} \ln(n) = \infty$	As n gets larger, $\ln(n)$ gets larger.
$\infty^2 = \infty$	$\lim_{n \rightarrow \infty} n^2 = \infty$	As n gets larger, n^2 gets larger.
$\infty + \infty = \infty$	If $\lim_{n \rightarrow \infty} f(n) = \infty$, $\lim_{n \rightarrow \infty} g(n) = \infty$, then $\lim_{n \rightarrow \infty} f(n) + g(n) = \infty$	As n gets larger, $f(n)$ and $g(n)$ gets larger, and so does their sum.
$\infty * \infty = \infty$	If $\lim_{n \rightarrow \infty} f(n) = \infty$, $\lim_{n \rightarrow \infty} g(n) = \infty$, then $\lim_{n \rightarrow \infty} f(n)g(n) = \infty$	As n gets larger, $f(n)$ and $g(n)$ gets larger, and so does their product.