Infinity

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Notations

Traditional name

Infinity

Traditional notation

∞

Mathematica StandardForm notation

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Infinity
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Primary definition

∞ is a symbol that represents a positive infinite quantity.

General characteristics

∞ is a special symbol. On the Riemann sphere it is the north pole approached from exactly East. In the projective complex plane it is a point at the line at infinity.

Limit representations

02.11.09.0001.01

$$\infty = \lim_{z \to 0^+} \frac{1}{z}$$

Transformations

Products, sums, and powers of the direct function

Products involving the direct function

02.11.16.0001.01

$0\,\infty == ¿$

02.11.16.0002.01

$a\,\infty == \tilde{\infty}\ /;\ a \neq 0$

02.11.16.0003.01

$a\,\infty == \infty\ /;\ a > 0$

02.11.16.0004.01

$$\frac{\infty}{\infty} == ¿$$

Sums of the direct function

02.11.16.0005.01

$$\infty + \infty == \infty$$

02.11.16.0006.01

$$\infty - \infty == ¿$$

Related transformations

02.11.16.0007.01

$$\infty^0 == ¿$$

02.11.16.0008.01

$$1^\infty == ¿$$

Complex characteristics

Real part

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$$\mathrm{Re}(\infty) == \infty$$

Imaginary part

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$$\mathrm{Im}(\infty) == 0$$

Absolute value

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$$|\infty| == \infty$$

Argument

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$$\arg(\infty) == 0$$

Conjugate value

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$$\overline{\infty} == \infty$$

Differentiation

Low-order differentiation

02.11.20.0001.01

$$\frac{\partial \infty}{\partial z} == 0$$

Integration

Indefinite integration

02.11.21.0001.01

$$\int \infty \, dz == z \, \infty$$

Summation

Finite summation

02.11.23.0001.01

$$\sum_{k=0}^{m} \infty = \infty$$

02.11.23.0002.01

$$\infty - \infty = ¿$$

Integral transforms

Fourier exp transforms

02.11.22.0001.01

$$\mathcal{F}_t[\infty](z) == \delta(z)\,\infty$$

Inverse Fourier exp transforms

02.11.22.0002.01

$$\mathcal{F}_t^{-1}[\infty](z) == \delta(z)\,\infty$$

Fourier cos transforms

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$$\mathcal{F}c_t[\infty](z) == \delta(z)\,\infty$$

Fourier sin transforms

02.11.22.0004.01

$$\mathcal{F}s_t[\infty](z) == \frac{\infty}{\text{sgn}(z)}$$

Laplace transforms

02.11.22.0005.01

$$\mathcal{L}_t[\infty](z) == \frac{\infty}{z}$$

Inverse Laplace transforms

02.11.22.0006.01

$\mathcal{L}_t^{-1}[\infty](z) == \delta(z)\,\infty$

Representations through more general functions

Through other functions

02.11.26.0001.01

$\infty == -\log(0)$

Representations through equivalent functions

02.11.27.0001.01

$\infty == 1\,\infty$

02.11.27.0002.01

$\infty == |\tilde{\infty}|$

History

– John Wallis (1655) introduced the sign ∞ to signify infinite number

– K. Weierstrass (1876) used symbol ∞ to represent an actual infinity, which is prototype ofsymbol ComplexInfinity $\tilde{\infty}$ in Mathematica

The symbol ∞ is encountered often in mathematics and the natural sciences.

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