

# KroneckerDelta

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## Notations

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### Traditional name

Kronecker delta function

### Traditional notation

$\delta_n$

### Mathematica StandardForm notation

KroneckerDelta[n]

## Primary definition

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$$\delta_0 = 1$$

$$\delta_n = 0 \text{ ; } n \neq 0$$

The below formula accumulates the above definitions for different values  $n$  in one expression.

$$\delta_n = \begin{cases} 1 & n = 0 \\ 0 & \text{True} \end{cases}$$

## Specific values

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### Values at fixed points

$$\delta_0 = 1$$

$$\delta_1 = 0$$

$$\delta_{-1} = 0$$

$$\delta_i = 0$$

### Values at infinities

$$\delta_{\infty} = 0$$

$$\delta_{-\infty} = 0$$

## General characteristics

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### Domain and analyticity

$\delta_n$  is a nonanalytical function defined on  $\mathbb{C}$ . Its possible values are 0 and 1.

$$n \rightarrow \delta_n :: \mathbb{C} \rightarrow \{0, 1\}$$

### Symmetries and periodicities

#### Parity

$\delta_n$  is an even function.

$$\delta_{-n} = \delta_n$$

#### Periodicity

No periodicity

## Transformations

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### Transformations and argument simplifications

$$\delta_{-n} = \delta_n$$

## Differentiation

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### Low-order differentiation

$$\frac{\partial \delta_n}{\partial n} = 0$$

### Fractional integro-differentiation

$$\frac{\partial^\alpha \delta_n}{\partial n^\alpha} = \frac{n^{-\alpha} \delta_n}{\Gamma(1 - \alpha)}$$

## Integration

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## Indefinite integration

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$$\int \delta_z dz = \delta_z z$$

## Representations through equivalent functions

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$$\delta_n = \delta(n)$$

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$$\delta_n = \delta(n_1, n_2, \dots, n_m) /; n_1 = n \wedge m = 1$$

04.24.27.0003.01

$$\delta_n = \delta_{n,0}$$

## History

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–L. Kronecker (1866, 1903)

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