The Algebraic Relative Difference

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Given two numbers $x, y \in \{\mathcal{Q}, \infty\}$ of the same sign, the algebraic relative difference, $\bar{\Delta}$ is computed according to the table

d \ n	0	n	∞	NaN
0	0	*	*	*
d	0	n/d	*	*
∞	*	*	1	NaN

where

$$n = (x^2 - y^2)^2, \qquad d = (x^2 + y^2)^2,$$

and * represent impossible situations.

Properties

The $\bar{\Delta}$ is undefined for $x = \infty,\ y = \infty$. The values x and y are treated symmetrically; neither is considered to be the "true" value. For rational x, y, there is a one-to-one mapping between either x/y or y/x and $\bar{\Delta}$. The $\bar{\Delta}$ is insensitive to *very* small differences between x and y, sensitive in the neighborhood of $\max(x, y) = 2\ \min(x, y)$, and less and less sensitive with greater and greater differences.

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