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indeterminate form

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The expression

$$\frac{0}{0}$$

is known as the *indeterminate form*. The motivation for this name is that there are no rules for comparing the value of  $\frac{0}{0}$  to the other real numbers. Note that, for example,  $\frac{1}{0}$  is *not* indeterminate, since we can justifiably associate it with  $+\infty$ , which *does* compare with the rest of the real numbers (in particular, it is defined to be greater than all of them.)

## 1 Other Indeterminate Forms

Although  $\frac{0}{0}$  is often called “the” indeterminate form, there are many others. Some of these are:

1.  $\frac{\infty}{\infty}$ , for the same motivating reasons as  $\frac{0}{0}$ .
2.  $0^0$ ; which is the result of much impassioned debate (especially since  $0!$  is defined to be 1, counter-intuitively, but not unreasonably).
3.  $1^\infty$ ; notably because of the derivation of  $e$ :

$$\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n = e$$

A direct substitution would yield  $1^\infty$ .