

= 1 and $x =$

k , in which case e is the number whose natural logarithm is 1. There are alternative characterizations.

Sometimes called Euler's number after the Swiss mathematician Leonhard Euler, e is not to be confused with ϕ , the Euler–Mascheroni constant, sometimes called simply Euler's constant. The number e is also known as Napier's constant, but Euler's choice of the symbol e is said to have been retained in his honor. The constant was discovered by the Swiss mathematician Jacob Bernoulli while studying compound interest.

The number e is of eminent importance in mathematics, alongside 0, 1, π and i . All five of these numbers play important and recurring roles across mathematics, and are the five constants appearing in one formulation of Euler's identity. Like the constant π , e is irrational: it is not a ratio of integers. Also like π , e is transcendental: it is not a root of any non-zero polynomial with rational coefficients. The numerical value of e truncated to 50 decimal places is

2.71828182845904523536028747135266249775724709369995 ... (sequence A001113 in the OEIS).

== History ==

The first references to the constant were published in 1618 in the table of an appendix of a work on logarithms by John Napier. However, this did not contain the constant itself, but simply a list of logarithms calculated from the constant. It is assumed that the table was written by William Oughtred. The discovery of the constant itself is credited to Jacob Bernoulli, who attempted to find the value of the following expression (which is in fact e):

<formula>

The first known use of the constant, represented by the letter b , was in correspondence from Gottfried Leibniz to Christiaan Huygens in 1690 and 1691. Leonhard Euler introduced the letter e as the base for natural logarithms, writing in a letter to Christian Goldbach of 25 November 1731. Euler started to use the letter e for the constant in 1727 or 1728, in an unpublished paper on explosive forces in cannons, and the first appearance of e in a publication was Euler's *Mechanica* (1736). While in the subsequent years some researchers used the letter c , e was more common and eventually became the standard.

== Applications ==

=== Compound interest ===

Jacob Bernoulli discovered this constant in 1683 by studying a question about compound interest:

An account starts with \$1.00 and pays 100 percent interest per year. If the interest is credited once, at the end of the year, the value of the account at year-end will be \$2.00. What happens if the interest is computed and credited more frequently during the year?

If the interest is credited twice in the year, the interest rate for each 6 months will be 50%, so the initial \$1 is multiplied by 1.5 twice, yielding \$1.00 \times 1.5²

= \$2.25 at the end of the year. Compounding quarterly yields \$1.00 \times 1.25⁴ =

\$2.4414 ..., and compounding monthly yields \$1.00 \times (1 + 1/12)¹²

= \$2.613035 ... If there are n compounding intervals, the interest for each interval will be 100% / n and the value at the end of the year will be \$1.00 \times (1 + 1/ n) ^{n} .

Bernoulli noticed that this sequence approaches a limit (the force of interest) with larger n and, thus, smaller compounding intervals. Compounding weekly ($n =$