

## Precalculus

# Logarithm notation and the infamous notation $\log x$

Todor Milev

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What does  $\log x$  stand for? **WARNING:** there are **two different** accepted uses for  $\log x$ .

- In some texts/applications  $\log x$  stands for

$$\log x = \log_{10} x \quad .$$

- Used in many engineering texts.
- Used in many natural sciences texts.
- Used in many high school textbooks.
- Used in old math textbooks.

- In other texts/applications  $\log x$  stands for (the principal branch of the) **complex logarithm**

$$\log x = \begin{cases} \ln x = \log_e x & \text{if } x > 0 \\ \ln(-x) + \pi i & \text{if } x < 0 \\ ? & \text{for } x \notin \mathbb{R} \end{cases} .$$

- Used in mathematical, many computer science texts.
- Used in many natural science texts.
- Used in most computer algebra systems.
- This is the notation accepted by most mathematicians.
- $\log$  and  $\ln$  have different domains but else coincide:  $\ln$  is defined for positive reals, and  $\log$  - for non-zero complex.

- *In the present course we shall abstain from using the notation  $\log x$ .*
- *When we need logarithms base 10 we will always write  $\log_{10}$ .*
- Within this course, we request that the student abstain from using  $\log x$  and use instead the unambiguous  $\log_{10} x$ .
- Outside of this course, we recommend that the student continue avoiding the notation  $\log$ .
- Should our recommendation contradict the commonly accepted conventions in the field of study of the student, we expect the student to honor the conventions of their fields of study.

# Summary of logarithm notation conventions

	Name	ISO notation	Other notation	Used in
$\log_2(x)$	binary logarithm	$\text{lb}(x)$	$\text{ld}(x)$ , $\log(x)$ , $\text{lg}(x)$	computer science, information theory, music theory, photography
$\log_e(x)$	natural logarithm	$\ln(x)$	$\log(x)$	mathematics, physics, chemistry, statistics, economics, information theory, and engineering
$\log_{10}(x)$	common logarithm	$\text{lg}(x)$	$\log(x)$	various engineering, logarithm tables, handheld calculators, spectroscopy

Table source: Wikipedia

- Standardized in ISO\_31-11 (International Standards Organization).