

## The logarithm function

### Introduction

This leaflet provides a table of values and graph of the logarithm function  $y = \log_e x$ .

### 1. The logarithm function and its graph

Logarithms have been explained on leaflet 2.19 *What is a logarithm ?*. There we showed how logarithms provide alternative ways of writing expressions involving powers, and we showed how a calculator can be used to find logarithms.

The **natural logarithm function** is  $y = \log_e x$ , also written  $\ln x$ .

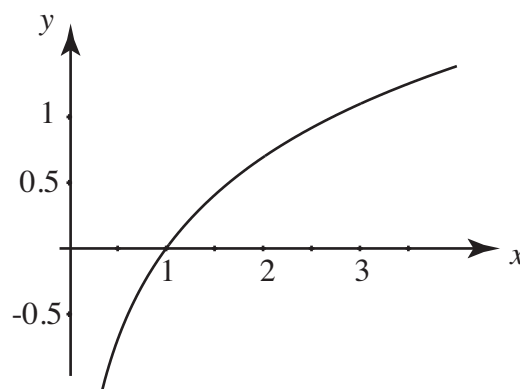
Note that we have chosen to use logarithms to base e as this is the most common base.

Using a calculator it is possible to construct a table of values of  $y = \log_e x$  as follows:

$x$	0.5	1	1.5	2	2.5	3	3.5
$y = \log_e x$	-0.693	0	0.405	0.693	0.916	1.099	1.253

You should check these values for yourself to make sure that you can obtain them.

If pairs of  $x$  and  $y$  values are plotted we obtain a **graph** of the logarithm function as shown.



The graph of the natural logarithm  $y = \log_e x$

Note that the logarithm function is only defined for positive values of  $x$ . We cannot find the logarithm of 0, or the logarithm of a negative number.

As an exercise you should draw up a similar table for the function  $y = \log_{10} x$  and plot its graph. The graph should have the same general shape as the one above although most of the points on the graph are different.