Natural Logarithm

The function \( y = e^x \) and its inverse function, the natural logarithm function \( y = \ln x \), are shown in Figure 13. Because the curve \( y = e^x \) crosses the \( y \)-axis with a reflected curve \( y = \ln x \) crosses the \( x \)-axis with a slope of 1.

Natural logarithm function

The graph of \( y = \ln x \) as given in Figure 13. Using the transformations, we shift it 2 units to the right to get the graph of \( y = \ln(x - 2) \) and 3 units down to get the graph of \( y = \ln(x - 2) - 1 \). (See Figures 15 and 16.)

1.6 Exercises

1. (a) What is a one-to-one function?
   (b) How can you tell from the graph of a function whether it is one-to-one?

2. (a) Suppose \( f \) is a one-to-one function with domain \( A \) and range \( B \). How is the inverse function \( f^{-1} \) defined? What is the domain of \( f^{-1} \)? What is the range of \( f^{-1} \)?
   (b) If you are given a formula for \( f \), how do you find a formula for \( f^{-1} \)?
   (c) If you are given the graph of \( f \), how do you find the graph of \( f^{-1} \)?

3-14 A function is given by a table of values, a graph, a formula, or a verbal description. Determine whether it is one-to-one.

Graphing calculator or computer with graphing software required

10. \( f(x) = 10 - 3x \)
12. \( g(x) = \cos x \)
13. \( f(t) \) is the height of a football \( t \) seconds after kickoff.
14. \( f(t) \) is your height at age \( t \).