Note 3.4 - Derivatives of Exponential and Logarithmic Functions

1 Introduction

Let's fill in the last piece of puzzle: the derivatives of e^x and $\ln x$. The results will strongly reflect the facts that exponential functions are the standard functions to describe quantities whose rate of change depend on the quantities themselves.

2 The Derivative of e^x

To differentiate e^x, we first derive the following limit:

$$\lim_{h \to 0} \frac{e^h - 1}{h} = 1.$$

Then, the derivative of e^x follows easily from the power rules.

We see that the rate of change of e^x is itself!

3 The Derivative of $\ln x$

The derivative of $\ln x$ can be derived easily with our available tools:

4 Arbitrary Bases

With our definitions of a^x and $\log_a x$ in Note 1, their derivatives are now easy to derive.

5 Examples