1 Introduction

The exponential function is a function denoted by

$$\exp(x) = e^x \tag{1}$$

The exponential function grows faster and faster as x grows. For negative x, the function will near 0, but never cross it.

The inverse of the exponential function is the natural logarithm, $\ln(x)$.

2 Implementation

This report uses a "quick and dirty" implementation of the exponential function, given as

$$f(x) = 1 + x + \frac{x^2}{2} + \frac{x^3}{3} + ... + \frac{x^{10}}{10} \tag{2}$$

The exponential function can be characterized as a power series, when looking at real numbers,

$$\exp(x) = \sum_{k=0}^{\infty} \frac{x^k}{k!} \tag{3}$$

which, for $k = 0$ to $k = 10$, is exactly $f(x)$. This is a lot of terms and should function nicely in many cases.

But for $x > \frac{1}{8}$, $f(x/2)^2$ is calculated instead. This is because our implementation is a power series around zero, so values far from zero, will be more incorrect. Instead, we divide the x value with two, calculate the exponential and then take it to the power of two. For the exponential function, this is the same.

3 Test

As can be seen in fig. 3, the implementation is working. The two functions are exactly on top of each other. The precision of the implementation compared to the exponential function is of the order of 10^{-16} for $x \sim 1$, while for $x \sim 9$ it is of the order 10^{-10}, obviously becoming less and less precise, but still well within the accepted area, while the relative precision goes from 10^{-17} to 10^{-15}, indicating even less of a difference, when you take the size of the numbers into account.

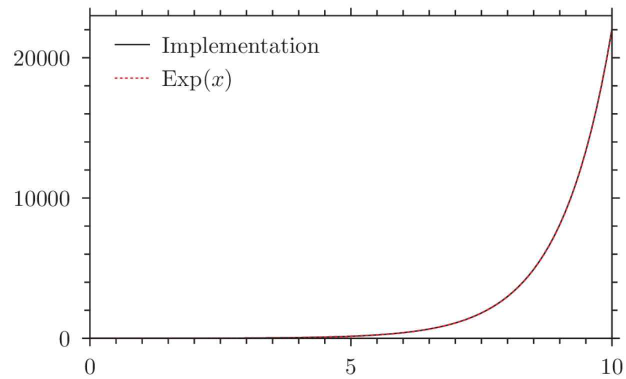

Figure 1: The solid, black line is the implementation, eq. (2), while the red dashed line in the exponential function.