Exponetial function

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May 24, 2022

Abstract

In this article a power serie reprecentation of the exponential function is investergated.

1 Introduction

The exponential function normally denoted as:

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

The exponential function can be reperecented using a power series [1]:

$$e^x = \sum_{k=0}^{\infty} \frac{x^k}{k!} = 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \frac{x^4}{24} + \cdots. \tag{2}$$

This reprecentation only uses which only uses multiplications and divisions.

2 Implementation

The inplementation is made in C#. The implematation of the power function reprecentation are done in the following way:

```
static double ex(double x){
        if(x<0)
                return 1/ex(-x);
        if(x>1.0/8)
                return Pow(ex(x/2),2);
        return 1+x*(1+x/2*(1+x/3*(1+x/4*(1+x/5*(1+x/6*
        (1+x/7*(1+x/8*(1+x/9*(1+x/10)))))))));
}
```

Starting from the top, if the $x < 0$ the the function call itself but now rewritten using a positive value of x. if $x > 1/8$ the function the function calls itself but with a smaller agument, wich is $x/2$, wich gives an better accuricy. To account for halving the agument, the the result from the expomential equation is squared. At last if $0 <= x <= 1/8$ then a revritten version of the power function repecentation of the exponential function is called.

[1] https://en.wikipedia.org/wiki/Exponential_function

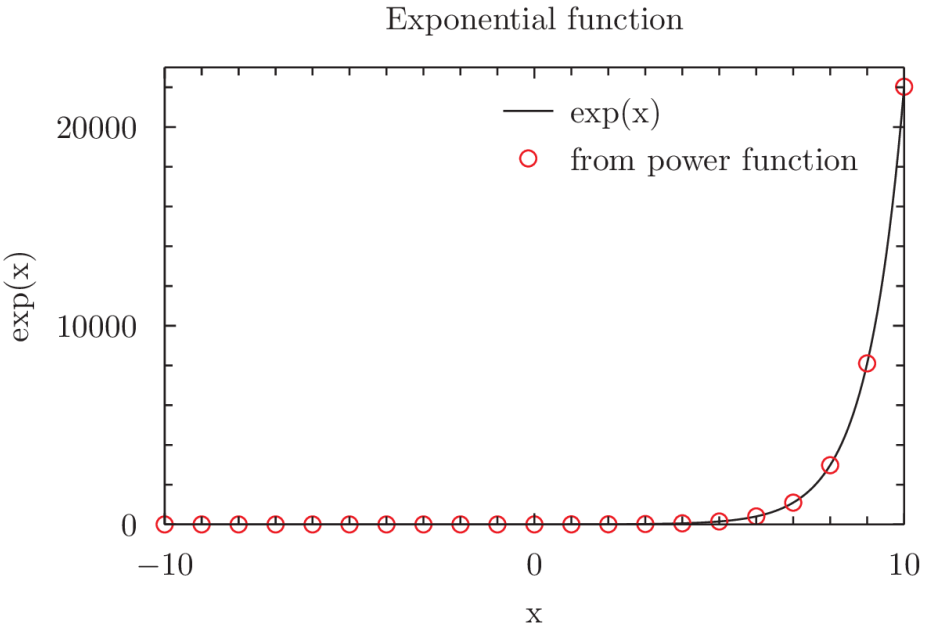

Figure 1: Exponential function plottet togeter with the power funtion reprecentation.

3 Results

In figure 1 are plottet trogether with results from the power function reprecentation equation 2.