

# A brief introduction to L<sup>A</sup>T<sub>E</sub>X document preparation system

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## Abstract

We will explain some basics about the exponential function, and discuss a simple code to calculate it in C.

## 1 The exponential function

The exponential function is an import function for both math and physics, since it can describe exponential growth which is an important concept for example for radioactive decay. It can be defined in many ways one is through its powerseries as follows by equation

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} \quad (1)$$

It can also be written as the limit of the following sequence

$$e^x = \lim_{n \rightarrow \infty} (1 + x/n)^n \quad (2)$$

## 2 The code

```
double ex(double x)
if(x<0)return 1/ex(-x);
if(x>1./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)))))))));
```

I have been given the above C-code function which can calculate the exponential function, and will explain how it works.

The code first checks if its argument is negative, because if it is, it will call itself again with a new argument, so it will end up returning a value on the form  $\frac{1}{e^{x(-x)}}$ , which is mathematically identical to what we want. Then it checks if the argument is of a certain size, since this approach works best for small arguments, if it is above 1/8 we half the argument through another mathematical identity. When all this is checked and dealt with it finally tries to calculate  $e^x$  based on the first 10 values of the sequence described by equation.

## 3 Test of code

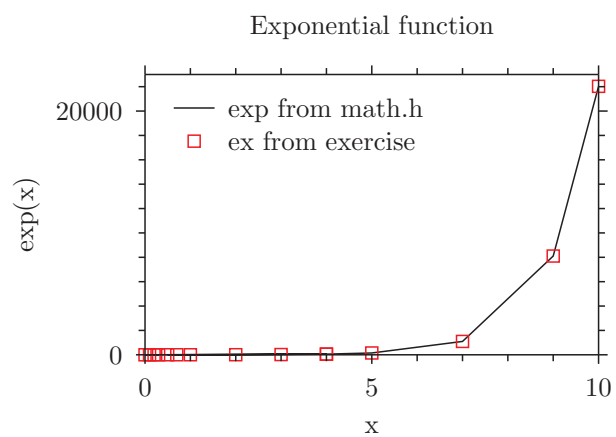


Figure 1: Exercise function vs math.h exp.