A short implementation of the exponential function in the C-language

Camilla Theresia Grøn Sørensen

1 About the exponential function

The exponential function takes an argument x and calculates the Euler's number to the power of the argument. Euler's number is $e = 2.71828$. The mathematical expression for the exponential function can be seen in equation 1.

$$y = e^x \tag{1}$$

2 Implementing the exponential function in the C-language

To make it easier for the computer to calculate the value of the exponential function, it is sometimes more useful to make use the Taylor expansion of the exponential function (equation 2):

$$y = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + ... = \Sigma_0^\infty x^n \tag{2}$$

To make it even easier for the computer to calculate, one can expand equation 2 until you get equation 3:

$$y = 1 + x \cdot (1 + x/2 \cdot (1 + x/3 \cdot (1 + x/4 \cdot (1 + x/5 \cdot (1 + x/6 \cdot (1 + x/7 \cdot (1 + x/8 \cdot (1 + x/9 \cdot (1 + x/10)))))))))) \tag{3}$$

It should be noted that equation 3 is only an approximation to equation 1.

3 Test of the implemented exponential function in the C-language

To test if equation 3 is a good approximation to equation 1, both equations are plotted for $0 < x < 8$. The result can be seen in figure 1.

As it can be seen from figure 1, equation 3 is a good approximation to equation 1.

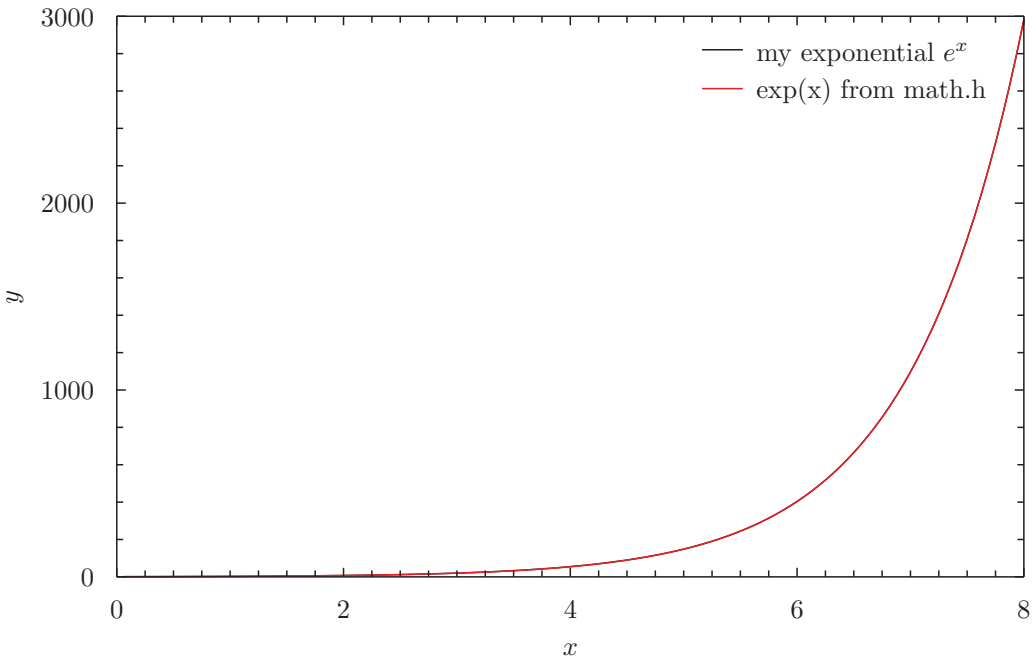

Figure 1: Plots of equation 3 (my exponential e^x) and equation 1 (exp(x) from math.h).