1 The relative error

The relative error e_i for the data set $i = 1, ..., n$ is given by:

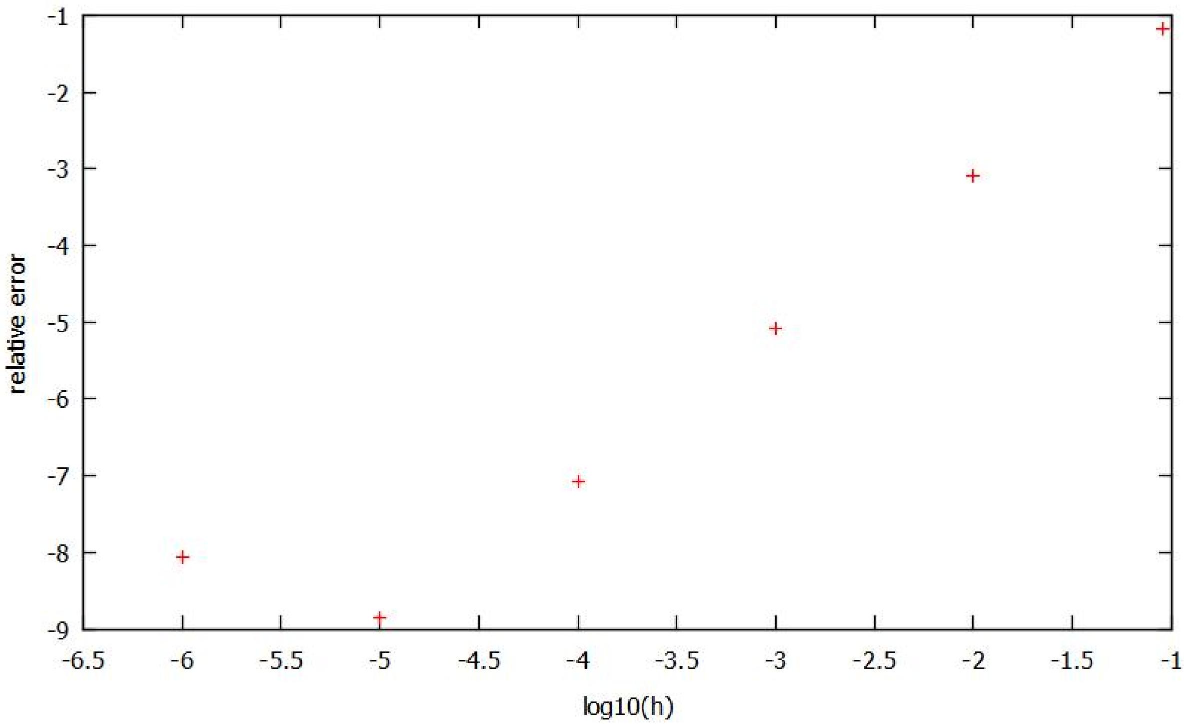
$$e_i = log_{10}\left(|\frac{v_i - u_i}{u_i}|\right) \tag{1}$$

We started with 10 steps and than increased the number of steps n by factor 10 until $n = 10^6$. The maximum values of the relative error for the different step lengths h are shown in table 1 and plotted in grafic 1.

Tabelle 1: max value of the relative error for different step lengths

$\log 10(h)$	e_i	n
-1.041392685	-1.179697782	10
-2.004321374	-3.088036832	100
-3.000434077	-5.080051538	1000
-4.000043427	-7.079270511	10000
-5.000004343	-8.847801518	100000
-6.000000434	-8.05486036	1000000

Abbildung 1: max value of the relative error for different step lengths



When we increase the number of steps what means to reduce the step length the relative error decreases linearly (with the $log10$ scale) until 10^5 steps. When we increase the number of steps further, to $n = 10^6$ the relativ error becomes bigger again. That shows that there is a limit how small we can make the step length, before we run into problems with loose of precision. This also means that we can only reduce the relative error of our computed results until a certain limit.