Exponential function: Quick and Dirty

Martin Cradock Østerlund

May 16, 2022

Abstract

The exponential function is a very important function used in multiple fields in physics. This short paper introduces a numerical computation of the exponential function, which uses only multiplication and division. I will be comparing it to the exponential algorithm implemented in C#.

1   Introduction

The "Quick and Dirty" implementation we will be looking at goes as follows.

```
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))))))))));
}
```

This implementation writes the exponential function as its Taylor series, including the first 10 elements of the series. If the function recieves a negative value, it calls the function as $exp(-x)^{-1}$. If we supply a value that is lower than some certain precision, in this case $1/8$, the function is called recursively as $exp(x/2)^2$ in order to get the required precision. In figure 1, the comparison between the "Quick and Dirty" implementation and the actual exponential function is shown.
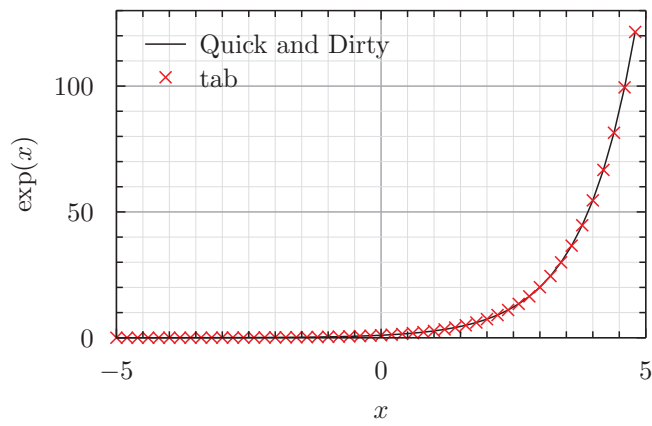
Figure 1: The comparison between the exponential function and the "Quick and Dirty" implementation.