Implementation of the exponential function

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Abstract

We show some basic capabilities of the LateX system: math, figures, references, sections...

1 The Exponential Function

The natural exponential function is defined as the function which is given as

$$f(x) = e^x \quad where \quad e = 2.71828... \tag{1}$$

This function is its own derivative:

$$\frac{d}{dx}e^x = e^x \log_e e = e^x \tag{2}$$

In a plot, the exponential function looks as shown on Figure 1.

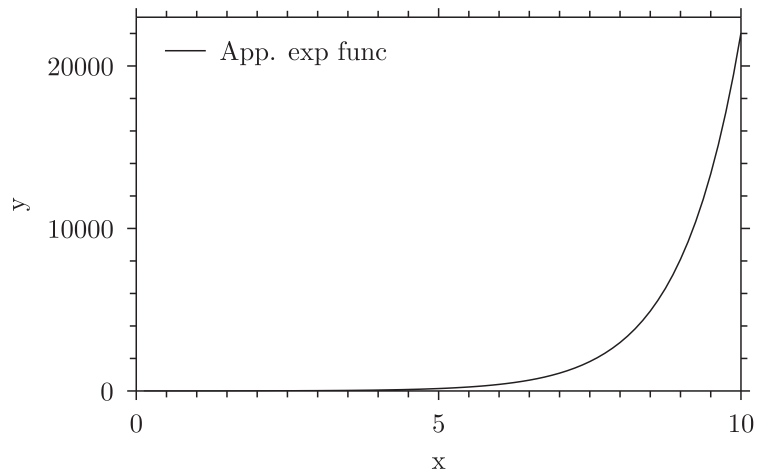
2 Approximations

As was shown from Figure 1, the exponential function is positive for all $x \in \mathcal{R}$. To describe the function at $x < 0$ we see that we should converge towards 0 for $x \to -\infty$. A function that does exactly that is $1/-x$, which ensures a positive sign while the fraction ensures the convergence towards 0.
When looking at the values of $x > 0$ we see that the function behaves as a parabular function therefore making it tempting to approximate by x^2.
When x is around origin, we can use a power expansion on the exponential funciton which can be shown to give

$$e^x = \sum_n \frac{x^n}{n!} = 1 + x\left(1 + \frac{1}{2}x\left(1 + \frac{1}{3}x\left(...\right)\right)\right) \tag{3}$$

Plotting the approximate exponential function on top of the real, we acquire figure 2

Error function



Exponential function