

Numerical Implementation of the Exponential Function

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The exponential function $\exp : \mathbb{C} \rightarrow \mathbb{C}$ is defined as

$$\exp(z) := \sum_{n=0}^{\infty} \frac{z^n}{n!}. \quad (1)$$

The infinite series in this definition poses some issues when it comes to implementing the exponential function numerically. A naive implementation would simply be truncating the series after N terms

$$\exp(z) \approx \sum_{n=0}^N \frac{z^n}{n!}. \quad (2)$$

This can be rewritten into

$$\exp(z) \approx 1 + z \left(1 + \frac{z}{2} \left(1 + \frac{z}{3} \left(1 + \dots \right) \right) \right). \quad (3)$$

A plot of eq. (3) for real z and with $N = 10$ is shown on fig. 1.

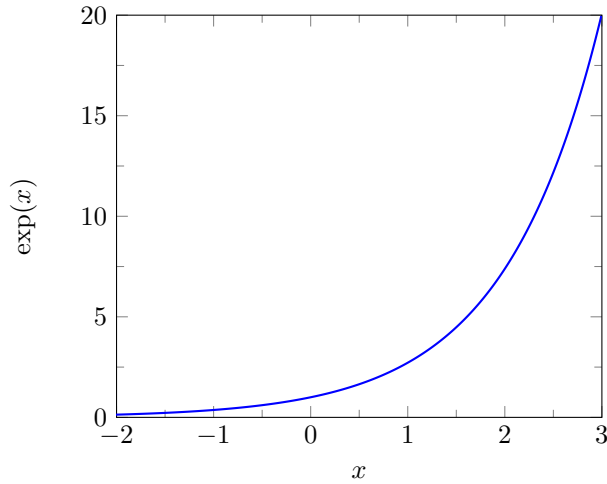


Figure 1: Numerical implementation of exponential function.