INSA | INSTITUT NATIONAL DES SCIENCES APPLIQUÉES ROUEN NORMANDIE

Document title

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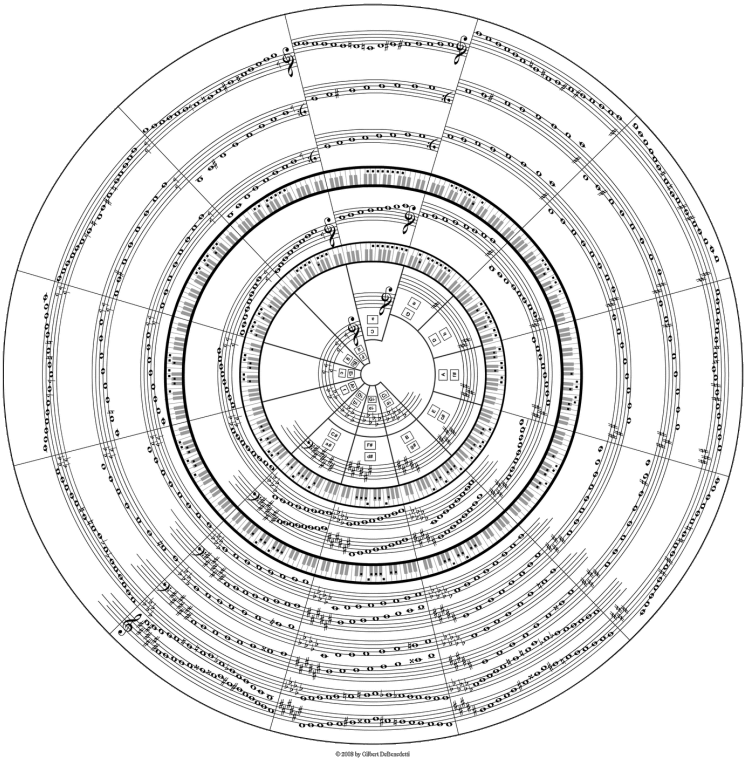

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Contents

1 Introduction

Basically I'm choosing a mathematical example to demonstrate the following:

- Equation rendering
- AMS theorem-like environments
- Code chunks in action

So let's talk about something familiar: **factorial**

2 Factorial

2.1 Basic definition and properties

The factorial of $n \in \mathbb{N}$ is defined as:

$$n! = \prod_{k=1}^{n} k$$

We can easily deduce that

$$n! = n \cdot (n-1)!$$

2.2 Implementation

Here's a recursive `python` implementation

```
def factorial(n):
    if n == 0:
        return 1
    return n * factorial(n - 1)
```

Let's call this function for $n = 4$

```
print(factorial(4))
```

```
## 24
```

3 Napier's constant (Euler's number)

3.1 Definition

Napier's constant can be defined in different ways, here's one:
Definition 3.1 (Napier's constant)**.** The number **e** is defined as the limit of the converging series

$$e = \sum_{n=0}^{\infty} \frac{1}{n!}$$

It is to be noted that the constant was discovered by the Swiss mathematician Jacob Bernoulli while studying compound interest. (Wikipedia contributors 2019)
Theorem 3.1 (Compound interest upper bound)**.** *In a bank account containing* 1 *unit of a certain currency, applying a* 100% *interest rate on the account divided into* n *times throughout the whole year would yield at the end of the year* e *units of the currency as* n *approaches infinity.*

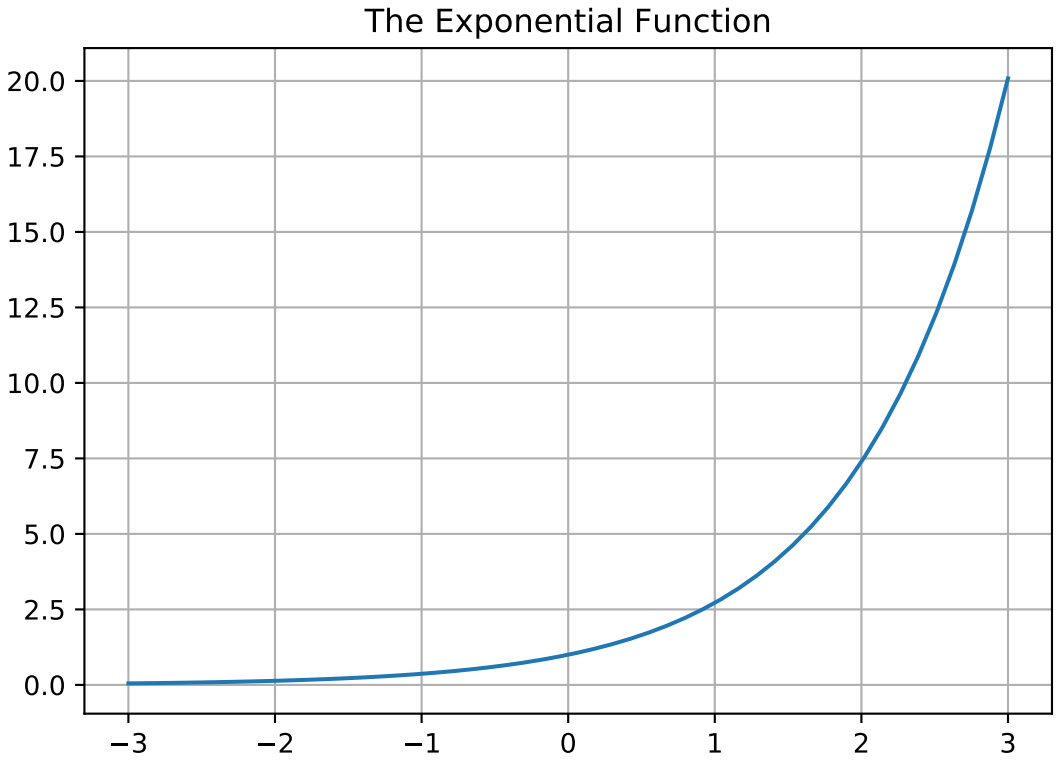
$$\lim_{n \to +\infty} \left(1 + \frac{1}{n}\right)^n = e$$

3.2 Exponential function

The exponential function is defined as

$$exp : x \mapsto e^x$$

Here's the graph of the function *(hidden python code chunk)*



4 Conclusion

This document covered a mathematical example featuring equations, theorems, graphs, and code.

There's also a cherry on top, since it is common to repeat a few mathematical expressions throughout the document and it's pretty annoying to rewrite the same expression over and over again, I usually use LaTeX macros that are stored in `include/abbrev.tex` to avoid repition and make the raw markdown file more readable. For example, instead of writing `\mathbb{N}` each time I want to write the set of natural numbers $\mathbb{N}$ I simply write `\N`.

References

Wikipedia contributors. 2019. “E (Mathematical Constant) — Wikipedia, the Free Encyclopedia.” https://en.wikipedia.org/w/index.php?title=E_(mathematical_constant)&oldid=879801944.