

Lab 1

1 Exercise on machine precision

- Execute the following code

```
import sys
help(sys.float_info)
print(sys.float_info)
```

and understand the meaning of *max*, *max_exp* and *max_10_exp*.

- Write a code to compute the machine precision ϵ in (float) default precision with a **while** construct. Compute also the mantissa digits number.
- Import NumPy (`import numpy as np`) and exploit the functions *float16* and *float32* in the while statement and see the differences. Check the result of `print(np.finfo(float).eps)`.

2 Exercises with matplotlib

2.1 Explore the matplotlib library

Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy, from <https://matplotlib.org/>

Create a figure combining together the cosine and sine curves, from 0 to 10:

- Add a legend.
- Add a title
- Change the default colors

2.2 Fibonacci and approximation

- Write a script that, given an input number n , computes the numbers of the Fibonacci sequence that are less than n .
- Write a code computing, for a natural number k , the ratio $r_k = \frac{F_{k+1}}{F_k}$, where F_k are the Fibonacci numbers.

– Verify that, for a large k , $\{r_k\}_k$ converges to the value $\varphi = \frac{1+\sqrt{5}}{2}$

- create a plot of the error (with respect to φ)