

Practice 2.1

Practice sheets are not assessed. The intention is to use material from lectures in preparation for Competence tests and Assignments. Some of these are difficult. You are encouraged to use `thing`, `[TAB]` and `thing?` in IPython.

Data structures

tuples and list

Make a list of tuples, where each tuple contains somebody's name and their age.

dictionaries

Make a dictionary which associates people's names with their ages.

Add an entry to the dictionary. Change an entry. Remove an entry (using `thing.pop`).

sets

Here are two sets:

```
s = {1,2,3}
```

```
r = {2,4,6}
```

Add/remove elements using `s.add` / `s.remove`. Find the intersection using the `s.intersection` method. Find the union using the method or the operator `|`.

What does $s \cap r$ do?

For other operations, such as the Cartesian product, see `itertools` library.

Integration

Use `trapz` or `quad` to evaluate the definite integral $\int_0^\infty e^{-x^2} \cos x \, dx$.

Write a *function* which computes the integral $F(x) = \int_0^x e^{-x'} \, dx'$ and plot $F(x)$ for $0 \leq x \leq 10$.

Accuracy

Consider the definite integral $I(x) = \int_0^x e^{-x'^3} \, dx'$. Find the accuracy to which `trapz` calculates $I(\infty)$ for an increasingly large endpoint and an increasingly large number of points. Plot the difference between the "correct" result and the calculated result as a function of these parameters.

Sieve of Eratosthenes [HARD]

Using Python sets, write a function `sieve` which implements the Sieve of Eratosthenes and returns all prime numbers less than a given positive integer N .