

Extensive information about Python, including the language reference, tutorials, modules etc. can be found on [www.python.org](http://www.python.org) and on [docs.python.org](http://docs.python.org).

### Some first steps in Python

- Have a look at file `loop.py`: The variable `i` is counted upwards and printed out. Try changing the loop's "range" to `range(3, 12)` or `range(3, 12, 2)`! You can also enter `range(` in spyder's console to get an in-line hint on its meaning.
- About Python's way of working with integer numbers: Define a variable like `num = 3` ahead of the for loop and multiply it by itself during each loop iteration. What do you observe? Use the console to divide a resulting "really large" number by 3.
- Repeat 2., but this time, start with `num = 3.!` Can you explain the different behavior? Use Python's built-in function `type()` to see various variables' or expressions' data types.
- Try this: `c = 1.6341; d = 9.; d * ( c / d ) - c`. Then, change `c` to 1.6346!

### Finite Differences and Convergence Test

File `convergence.py` contains elements for a convergence test of the right-sided operator  $D_h^+$  that approximates the first derivative  $f'$  as discussed in the lecture.

- Familiarize yourself with the python code: What does each function do ? Call them from the command line !
- A script to run an actual convergence test is in `convTest.py`. Try it out ! Which convergence order do you obtain ?
- Modify the programs to add the left-sided and central difference formulae and compare the orders of convergence.
- What happens if you make  $h$  *really* small ?