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Numerical Analysis II

ETH Zürich
D-MATH

Python Cheat Sheet

1 Download distribution

The python distribution **version 3.7** can be downloaded at Python Anaconda. The Anaconda navigator has an environment called **Spyder** (Scientific PYthon Development EnviRonment), which we recommend you use. It is very similar to Matlab with an editor window, a console and a variable space.

2 Useful commands

> `#`	comments the line
> `who`	lists the variables
> `whos`	lists the variables, along with their types and sizes
> `del x`	removes variable x
> `%reset`	deletes all variables
> `help(fun)`	prints the documentation of the function `fun`

3 Mathematical functions and constants

Standard mathematical functions and constants can be obtained from the package `numpy`. There are significant differences between how arrays are treated in the packages ‘array’ and ‘numpy’. For the sake of uniformity, therefore, we will stick to the numpy package.

> `import numpy as np`	imports the package
> `np.pi`	calls $\pi = 3.14159\ldots$
> `np.sin(x)`	evaluates $\sin(x)$
> `np.linspace(a,b,n)`	creates a linearly spaced vector with n points between a and b
> `np.linalg.eig(A)`	finds the eigenvalues and eigenvectors of the square matrix A
> `np.zeros(d)`	creates a vector of zeros of size d
> `np.zeros(d,n)`	creates a matrix of zeros of size $d \times n$
> `x**n`	computes x to the power n

The array indexing in Python starts at 0 and not 1 and accepts negative indices for indexing from the end of the array. For a given array x, $x[0]$ is the first element and $x[-1]$ the last one.

4 Standard packages

`> import numpy as np`	for standard mathematical functions and constants
`> import matplotlib.pyplot as plt`	for plotting
`> from numpy import linalg as LA`	for norms, etc.
`> from scipy.integrate import ode`	for ODE solvers

5 Plotting

Standard plotting tools can be obtained from the `pyplot` package in `matplotlib`.

`> import matplotlib.pyplot as plt`	imports the package
`> plt.plot(x, y)`	plots the vector x against y

6 ODE Solvers

Standard ODE solvers can be found in the `ode` package in `scipy.integrate`.

`> from scipy.integrate import ode`	imports the `ode` package