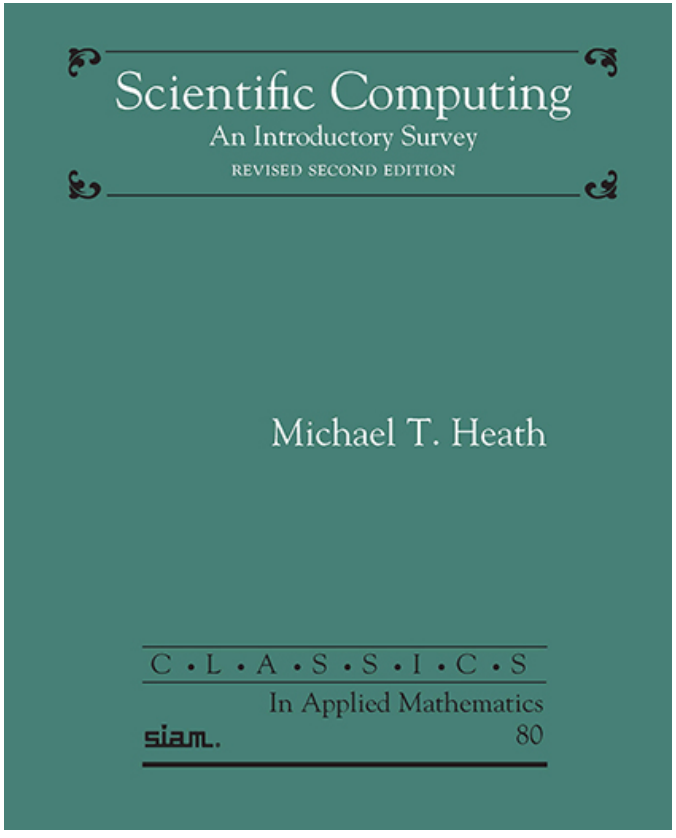
Introduction

Marcin Kuta

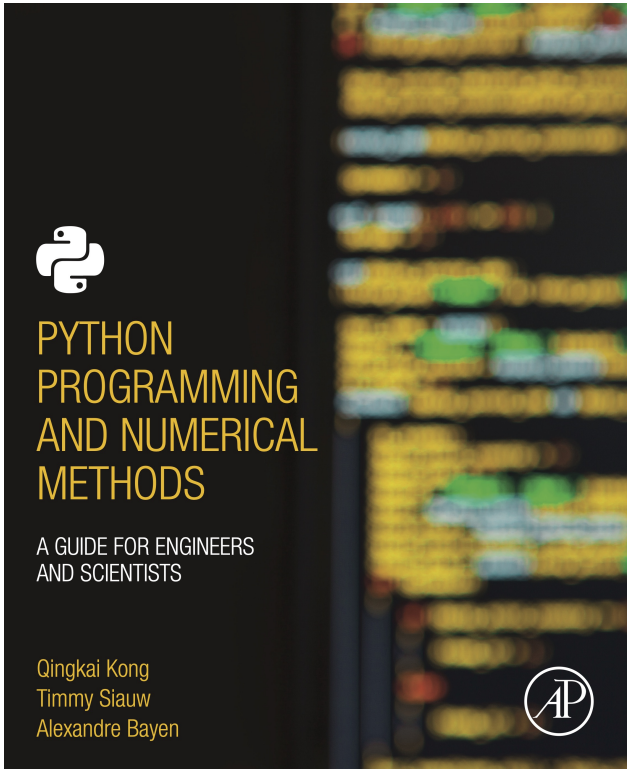
Literature

- Michael T. Heath,
  Scientific Computing. An Introductory Survey, 2nd Edition



Literature

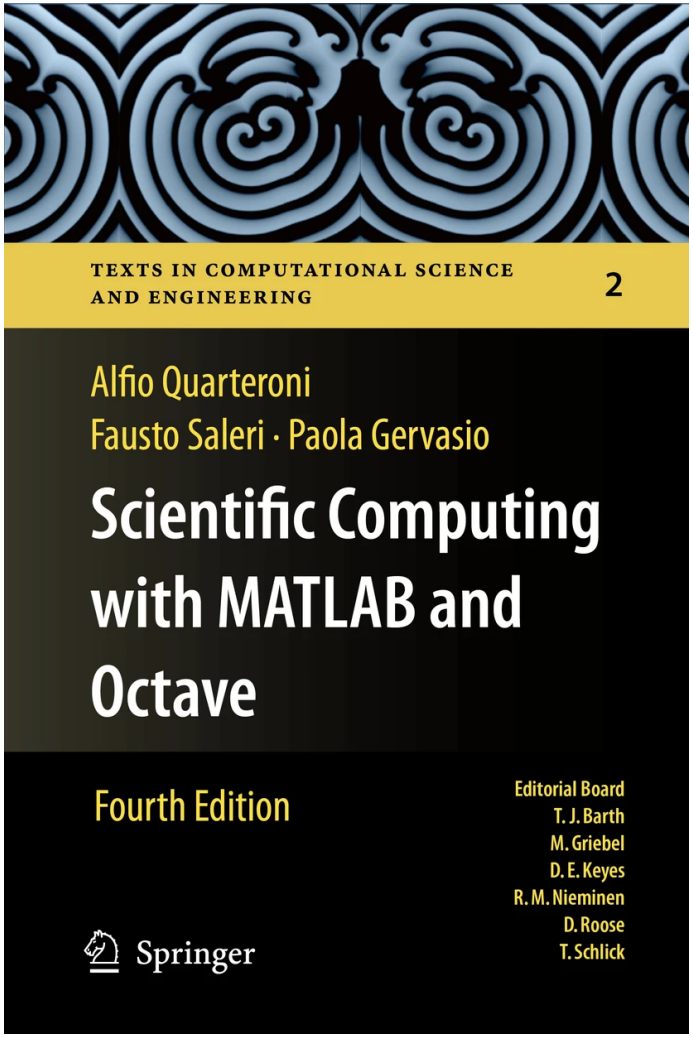
- Qingkai Kong, Timmy Siauw, Alexandre Bayen, Python Programming and Numerical Methods.



https://pythonnumericalmethods.berkeley.edu/notebooks/Index.html

Literature

- Alfio Quarteroni, Fausto Saleri, Paola Gervasio
  Scientific Computing with MATLAB and Octave, Fourth Edition



Matplotlib

Two types of API:

- MATLAB API
  - implicit
  - stateful
- object oriented API
  - explicit
  - necessary for more complicated figures

Matplotlib

```
import numpy as np
import matplotlib.pyplot as plt

x = np.linspace(-5, 2, 100)
y1 = x**3 + 5*x**2 + 10
y2 = 3*x**2 + 10*x
y3 = 6*x + 10

fig, ax = plt.subplots()
ax.plot(x, y1, color="blue", label="y(x)")
ax.plot(x, y2, color="red", label="y'(x)")
ax.plot(x, y3, color="green", label="y''(x)")
ax.set_xlabel("x")
ax.set_ylabel("y")
ax.legend()
plt.show()
```

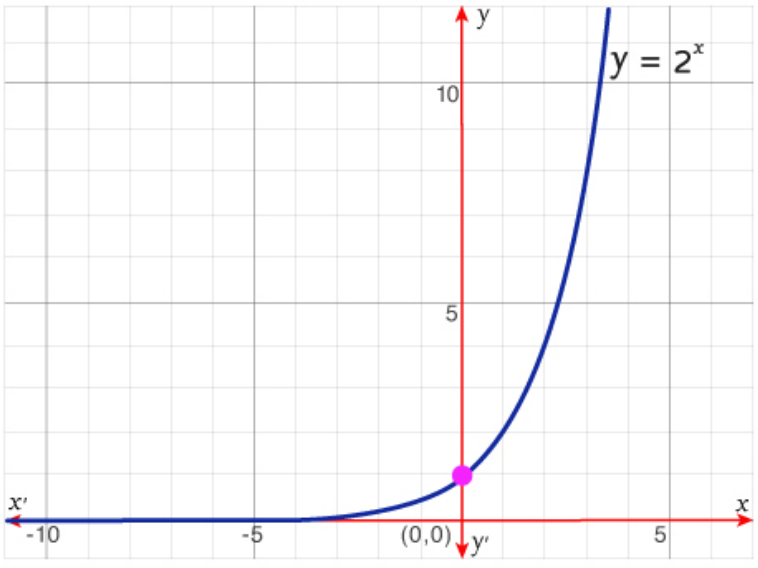
Plotting and visualization

Preparing plots for publication

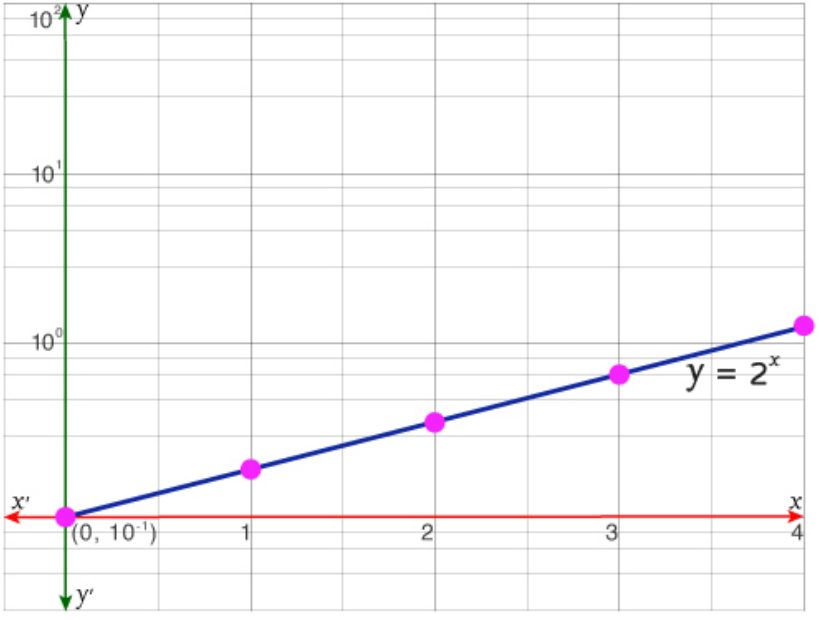
- https://nbviewer.jupyter.org/github/rasbt/matplotlib-gallery/blob/master/ipynb/publication.ipynb
- seaborn
  http://web.stanford.edu/~mwaskom/software/seaborn/
- mlxtend.plotting
  http://rasbt.github.io/mlxtend/
- prettyplotlib
  http://olgabot.github.io/prettyplotlib/

Plotting and visualization

Linear vs. semi-log graph



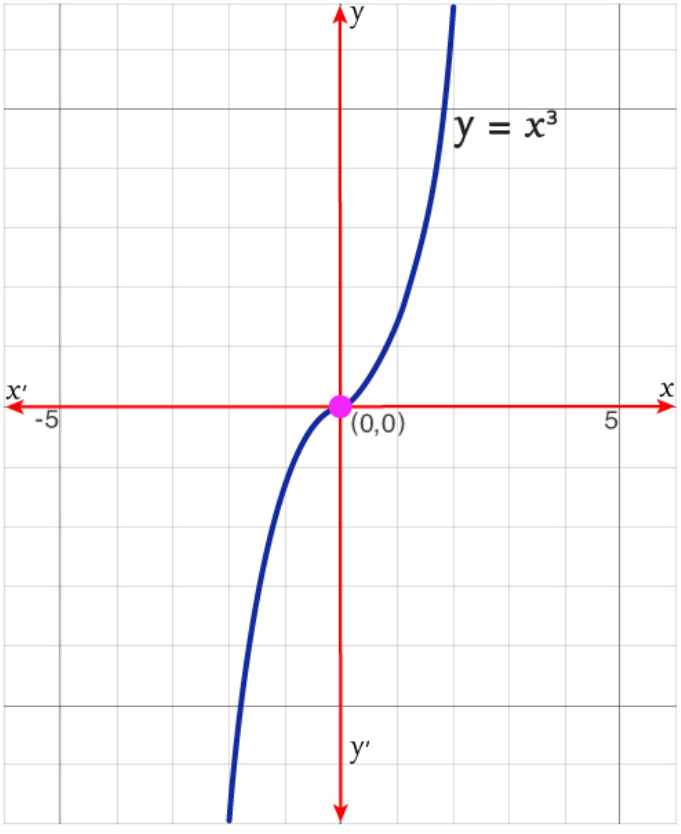
Linear Graph



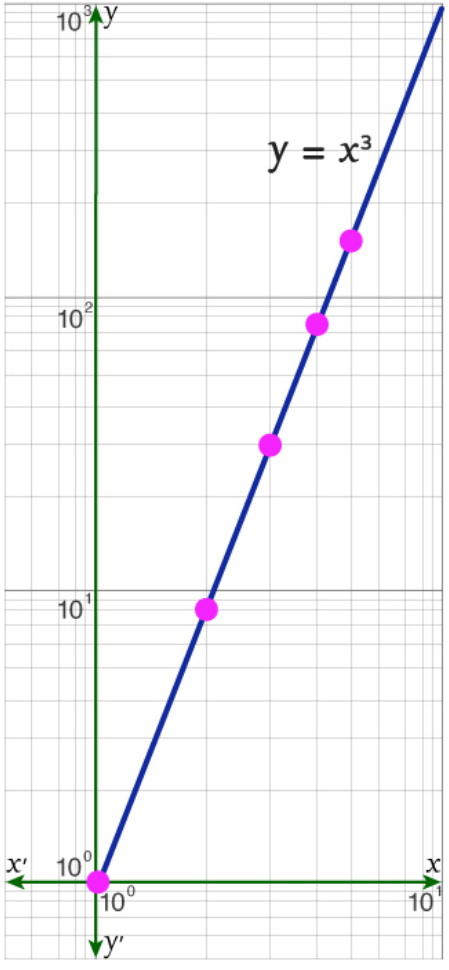
Semi-Log Graph

Plotting and visualization

Linear vs. log-log graph



Linear Graph



Log-Log Graph

Numpy

```
vec_a = [1,2,3]
vec_b = [4,5,6]

result = 0
for val1, val2 in zip(vec_a,vec_b):
    result += val1*val2

print(result)
```

```
import numpy as np

vec_a = np.array([1,2,3])
vec_b = np.array([4,5,6])

result = np.dot(vec_a, vec_b)
print(result)
```

References

[1] Michael T. Heath,
Scientific Computing. An Introductory Survey, 2nd Edition,
http://heath.cs.illinois.edu/scicomp/notes/
2002