

Computational Physics 3

Winter Semester 2018/2019

Distributed: 18/10/18

Due date: 24/10/18

Exercise 1:

1. Generate data $(x, f(x))$ for function:

$$f(x) = \frac{\sin(x)}{x}$$

In the interval $[-3\pi, 3\pi]$ with different spacing ($dx = 0.01, 0.005, 0.0025$)

hint: use `numpy.linspace` but be careful for $f(0)$

Optional: Save the data as 2 columns in a file 'data.txt'.

2. Plot the data in a single figure using `matplotlib`. Label the figure and add a custom title.

3. Calculate the derivative of the function $f(x)$ via central differencing. Implement your own central differencing algorithm into the function **central.diff**.

$$f'(x) = \frac{f(x + dx) - f(x - dx)}{2dx}$$

for different dx spacings (as give in 1.).

4. Calculate now the derivative with the numpy method `numpy.gradient`.
5. Calculate the convergence rate of the differencing method and plot it.

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