

## Training Assignment 12

NUMA01: Computational Programming with Python  
Malin Christersson, Robert Klöfkorn

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This exercise demonstrates the use of matplotlib's GUI and continues Training Exercise 11.

This assignment has 4 tasks.

## Warming-up Exercises

### Task 1

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Consult the `matplotlib` documentation: <https://matplotlib.org/stable/gallery/>. Obtain the code for the **Axes Demo** and run it. While there also look at other examples you find interesting.

### Task 2

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Obtain the code for one of the 3D plotting examples from the book Chapter 6 – Plotting and run it. Compare with the 3D plotting examples that you find on the `matplotlib` documentation page.

## Exercises

### Task 3

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Consider the function  $\sin(\omega x)$  and its second degree Taylor polynomial when expanded about a given point  $x_0$ . The aim of this task is to study the change of the Taylor polynomials in dependence of  $x_0$  and  $\omega$ . Modify your code of Assignment 11, so that it plots the function and its Taylor polynomial when  $x_0$  and  $\omega$  are given. Plot these two functions over the interval  $[0, 2\pi]$  in the way you plotted them in Training Assignment 11, Task 2 and 3.

### Task 4

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Now design and program a GUI which serves as a user friendly way to input interactively the two parameters  $x_0$  and  $\omega$  to fast and easily vary the curves to demonstrate their dependency on these parameters. Equip the GUI with all necessary text to make your program a good demonstration tool for Taylor's theorem.