Numerical Software Lab
Prof. Ulrich Kleinekathöfer
Spring term 2023
Project 3, due March 30, 2023 at 11:59 pm
to be uploaded to https://elearning.jacobs-university.de

CONSTRUCTOR UNIVERSITY

3. Project [100 points]

Write a script which has the following functionality inside:

a) [35 points] Write a function which, given a vector of coefficients **p** as well as a starting point a and an end point b, integrates the polynomial (see `np.polyval(p,x)`) from a to b and returns the value of the integral and the estimated error in two separate variables.

b) [65 points] Write a function which plots spherical Bessel functions in a 3D plot as a function of x and y with $r = \sqrt{x^2 + y^2}$. As input define which spherical Bessel function, $j_n(r)$ (first kind) or $y_n(r)$ (second kind), is being plotted and also the order n. Moreover, specify the x and the y range as input. Put axes with five ticks (and tick labels) in the x and y directions and four ticks in the z direction. Add title and proper labels. The plot shall not be displayed on the screen but be exported as a pdf file.

In the main part of the script call the functions with arbitrary test values and print input as well as output.

Happy coding!