

Exercise Sheet 5

Exercise 1

Implement the Trapezoid Integration Algorithm

Exercise 2

Implement the Simpson's Integration Algorithm.

Exercise 3

Try the two algorithms integrating the following function:

$$I = \int_0^{4\pi} x^2 \sin(x) dx \quad . \quad (1)$$

The integrand is an oscillating function, thus you can expect cancellations between positive and negative areas during the integration. Make a plot of the function if you think it could be useful.

Check your numerical results against the analytical solution:

$$I = -x^2 \cos x + 2x \sin x + 2 \cos x \quad . \quad (2)$$

Exercise 4

Show in a graph how the error in the integration of Eq. 2 scales with the mesh spacing $h = \frac{4\pi-0}{N}$ for the two algorithms.

Which algorithm scales better?