

Exercise Sheet 2

Exercise 1: Prepare a Matlab script that approximates $\int_a^b f(x)dx$

INPUT:

- a, b the boundary of the domain,
- m number of nodes of the partition of $[a, b]$,
- f the function you want to integrate.

OUTPUT:

- Absolute error when the integral is computable.
- the plot of the polynomial approximation and the exact solution with different colors,
- the plot of the error when increasing the degree n of the polynomial.

You might test your code on the following functions:

a) $\int_0^{2\pi} \sin(x) dx = 0,$

b) $\int_0^{2\pi} x e^{-x} \cos(2x) dx = \frac{3(e^{-2\pi} - 1) - 10\pi e^{-2\pi}}{25},$

c) $\int_{-5}^5 \frac{1}{1+x^2} dx,$

d) $\int_0^1 x^{5/2} dx,$

e) $\int_{-2}^2 x \sin(x) dx,$

f) $\int_{-1}^0 |x| dx = 0.5 \quad \int_{-1}^1 |x| dx = 1,$ (what happens if you have an even or an odd number of nodes?)

g) $\int_0^{2\pi} |\sin(x)| dx,$

h) $\int_{-1}^1 e^{-x^2} dx,$

i) $\int_{-3}^5 \operatorname{sgn}(x - \pi) dx,$