Università
della
Svizzera
italiana

Faculty
of Informatics

Numerical Algorithms

Fall 2020

Assignment 7

October 22, 2020

Exercise 1 [5 points]

Work out a third order method for approximating the first derivative of a function, based on a non-symmetric 4-point difference formula. That is, your approximation of $f'(x)$ should depend on $f(x-2h)$, $f(x)$, $f(x+h)$, and $f(x+2h)$. Test your method for the function

$$f(x) = \sqrt[3]{x} + x$$

at $x = 1$ and print out the approximation of $f'(1)$ as well as the error to the correct value (obtained by differentiating f symbolically and evaluating the derivative at $x = 1$) for $h = 10^{-k}$, $k = 1, \ldots, 15$.

Describe how you derived your formula, show that it really leads to a third order method, and hand in your code and the output.

Solutions must be returned online or in class on October 29, 2020