Mandatory Exercise 3

Numeriske metoder

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# Exercise 5

## Problem I

For N = 2 (only one midpoint), state by hand computations an analytical expression for the

approximation of the integral as obtained by the Extended Midpoint method.

### Solution

We need to approximate the integral using the extended midpoint method with N = 2 (only one midpoint).

First, we find the midpoint of the interval ([a, b]) given by

Then we evaluate the integrand at the midpoint.

The integrand is at so we get:

Now er then apply the midpoint rule for the integral, which is: .

Using this we get the approximation:

Furthermore, we know that the error estimate is given by and N = 2 so we get the final approximation:

## Problem II

With N = 2, 3, 5, 9, ... (corresponding to N - 1 = 1, 2, 4, 8,...) use the Extended Midpoint

method to approximate the integral. Terminate the subdivisions when you reach a proven

accuracy of better than 10-3. State your results in a table like those used during

the course and state how you computed the accuracy. State also how many f-computations

(Computations of the integrand for a given x) were needed. Submit the used code.

### Solution

A screenshot of a computer program

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## Problem III

Use DErule to approximate the integral. State your result and how many f-computations

were applied. Submit the used code.

### Solution

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## Full Terminal Solution

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