MA 322 - Scientific Computing

Lab - 6 (Date - 11/02/2025)

1. Evaluate the integral:

$$I(p) = \int_0^1 \frac{x^p}{(x^3 + 10)}\, dx$$

for $p = 0, 1$, using the **Trapezoidal Rule** and **Simpson's Rule** with 11, 21, and 41 points.

2. Write a program to approximate the first derivative of the function:

$$f(x) = e^x$$

at $x = 1$ using the central difference formula:

$$f'(x) \approx \frac{f(x+h) - f(x-h)}{2h}$$

where $h = 0.1$ and $h = 0.05$. Use Richardson's Extrapolation to obtain a more accurate estimate.

Steps to Follow:

- Compute the derivative using the central difference formula for $h = 0.1$ and $h = 0.05$.
- Apply Richardson's extrapolation.
- Compare the extrapolated result with the exact derivative:

$$f'(x) = e^x$$

at $x = 1$.