

# CENG 216 – NUMERICAL COMPUTATION

## Homework 3

4 May 2021

**Due Date:** 18 May 2021

**Note:** You are required to submit the homework solutions as handwritten text that belongs personally to you. Typesetting and printing are not allowed.

### **Exercise 1**      *(25 points)* **Newton's Method with Numerical Derivatives**

We are given the following function

$$f(x) = e^{\sin(e^x \cos(x) \ln(x))} - 1$$

with approximate root location  $x_0 = 0.6$  and  $f(x_0) = -0.5008502136577643$ .

Apply three iterations of Newton's method to find the approximate root  $x_r$  **using numerically approximated derivatives**. You may choose any valid approximation formula and step size.

*Hint:* Please use the given function value  $f(x_0)$  to check that you are evaluating the correct function.

### **Exercise 2**      *(25 points)* **Numerical Integration**

- Compute an approximation of the integral  $\int_0^1 x \cos x \, dx$  using the Simpson's rule.
- Compute an approximation of the integral  $\int_0^1 x \cos x \, dx$  using the composite Trapezoid rule by partitioning the interval  $[0, 1]$  into **two** sub-intervals.