

Department of Mathematics
Indian Institute of Technology Guwahati
MA311M: Lab Assignment 3

Date of Submission: 08/11/2020

Weightage: 10 Marks

1. The function $g(x)$ is defined by

$$g(x) = \int_0^x e^{-x^2} dx.$$

Write a program for composite rectangle rule (R_{rule}), trapezoidal rule (T_{rule}) and Simpson's rule (S_{rule}) to evaluate $g(1)$ with $N = 50, 100, 200$ subdivisions. Compare the results with the correct value $g(1) = 0.74682413$ and print the approximate values for R_{rule} , T_{rule} , S_{rule} and the corresponding errors E_R , E_T , E_S as per the format shown below. **[5 Marks]**

N	R_{rule}	T_{rule}	S_{rule}	E_R	E_T	E_S
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2. Consider the initial value problem

$$y'' = \cos(xy), \quad y(0) = 1, \quad y'(0) = 0, \quad 0 \leq x \leq 1.$$

Write a program for fourth-order Runge-Kutta method to produce approximations $y_n \approx y(x_n)$ at x_n with $x_n = x_0 + nh = \frac{n}{N}$, $n = 0, 1, 2, \dots, N$ for $N = 64$. Print the approximate results for $y(x_n)$, $y'(x_n)$ to six decimal places for $x_n = .25, .5, .75, 1$ as per the format shown below. **[5 Marks]**

x_n	$y(x_n)$	$y'(x_n)$
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Note: The program and output files should be submitted on or before the due date. No submission will be accepted after the due date. Output files should contain your Name and Roll number.