

MTP290 Spring 2023

Assignment 3

1 Instructions

1. The assignment can be attempted in teams of 2. Only one team member has to submit it. Discussions should only happen within the group. Your code will be checked for plagiarism.
2. Any descriptive answer should be written at the top of the code. Use '%' to comment inside the code.
3. Only **.m files are accepted**, any other type of files will not be evaluated.
Name them *A3_Qn_EntryNo1_EntryNo2.m*, where *n* is the question number. Submit the .m files for all questions separately, with only one file for each.
Do not make a zip.
4. **Assignment Deadline: 11.59pm April 23rd, 2023**

2 Problems

1. **(3 marks)** Write a program to evaluate $I = \int_{-4}^4 \frac{dx}{1+x^2}$ using the
 - (a) Trapezoidal rule
 - (b) Simpson's 1/3 rule
 - (c) composite trapezoidal and composite Simpson's 1/3 rule for $n = 10$
2. **(2 marks)** Write a MATLAB function that uses the midpoint rule to approximate the definite integral of a given function using an adaptive algorithm that increases the number of subintervals until the relative error is below the desired tolerance. Given $f(x) = 1/(1+x^2)$

$$a = 0, b = 1, tol = 1e - 6$$

3. **(1.5+1.5 marks)** (a) Write a MATLAB function that estimates the definite integral of a given function using Simpson's 1/3 rule.
Given $f(x) = \exp(x)/(1+x)$

$$a = 0, b = 2, n = 4$$

(b) Write a Matlab function that can approximate the integral of a function using Simpson's 3/8 rule. It should output the approximation of the integral and the number of iterations required to achieve the specified tolerance level. Given $f(x) = \sin(x)$

$$a = 0, b = \pi/2, tol = 1e - 6$$

4. **(2 marks)** For the function $f(x) = \sin(x)/x$ Write a MATLAB function that estimates the definite integral of a given function using the Trapezoidal Rule. Given $a = 0, b = 10, tol = 1e - 6$