



DESCRIPTION OF COURSEWORK

Course Code	BSC128/CST303*
Course Name	Numerical Methods
Lecturer	Goh Chien Yong
Academic Session	2022/04
Assessment Title	Assignment 3

A. Introduction/ Situation/ Background Information

Through this assignment, students are exploring to the knowledge of error analysis, numerical differentiation and integration.

B. Course Learning Outcomes (CLO) covered

At the end of this assessment, students are able to:

- CLO 1 Apply the concepts and theories in numerical methods.
- CLO 2 Calculate the solution of a mathematical problem numerically with an appropriate algorithm.

C. University Policy on Academic Misconduct

1. Academic misconduct is a serious offense in Xiamen University Malaysia. It can be defined as any of the following:
 - i. **Plagiarism** is submitting or presenting someone else's work, words, ideas, data or information as your own intentionally or unintentionally. This includes incorporating published and unpublished material, whether in manuscript, printed or electronic form into your work without acknowledging the source (the person and the work).
 - ii. **Collusion** is two or more people collaborating on a piece of work (in part or whole) which is intended to be wholly individual and passed it off as own individual work.
 - iii. **Cheating** is an act of dishonesty or fraud in order to gain an unfair advantage in an assessment. This includes using or attempting to use, or assisting another to use materials

that are prohibited or inappropriate, commissioning work from a third party, falsifying data, or breaching any examination rules.

2. All the assessment submitted must be the outcome of the student. Any form of academic misconduct is a serious offense which will be penalised by being given a zero mark for the entire assessment in question or part of the assessment in question. If there is more than one guilty party as in the case of collusion, both you and your collusion partner(s) will be subjected to the same penalty.

D. Instruction to Students

1. This is an individual assignment.
2. You are required to complete all the Three questions given.
3. You have to submit the assignment (softcopy) through Moodle before 04th Jun 2022, 5pm. Late submission will be penalised.
4. Handwriting/drawing is allowed in this assignment.
5. Attached the PDF-file upon submission, with naming as **StudentID_CourseCode_A3.pdf**.
6. The given cover page of assignment needs to be attached.
7. Always start a new question in new page.
8. Please do it on your own, any suspected misconduct will be directly reported to the Office of Academic Affair.

E. Evaluation Breakdown

No.	Component Title	Percentage (%)
1.	Question 1	10
2.	Question 2	40
3.	Question 3	40
4.	Report	10
	TOTAL	100

F. Task(s)

1. The forward-difference formula can be expressed as:

$$f'(x_0) = \frac{1}{h} [f(x_0 + h) - f(x_0)] - \frac{h}{2} f''(x_0) - \frac{h^2}{6} f'''(x_0) + O(h^3)$$

Use extrapolation to derive an $O(h^3)$ formula for $f'(x_0)$. [10]

2. Determine the values of n and h required to approximate $\int_0^2 x^2 \sin(-x) dx$ to within 10^{-6} using the Composite Trapezoid Rule, Composite Midpoint Rule and Composite Simpson's Rule respectively. [40]

Hint: You do not need to solve the numerical integration.

3. Given a function, $f(t) = \sqrt{t}$.

a) Apply the Romberg Integration to find $R_{3,3}$ for the integral $\int_1^4 f(t) dt$. [20]

b) Apply the Composite Simpson's Rule to approximate $\int_1^4 f(t) dt$ using eight intervals. [10]

c) Comment on your results in (a) and (b). [10]