



SCHOOL OF ADVANCED TECHNOLOGY

ICT - Applications & Programming
Computer Engineering Technology – Computing Science

Numerical Computing – CST8233

Lab #4 – Maclaurin Series

In this lab, you will write a script to implement the Maclaurin Series

You will need to show your lab professor to get your grades.

Grades:

2% of your final course mark

Deadline

During the lab period of Week 11.

Steps

Step 1. Maclaurin Series

Maclaurin series are used to expand a function around zero. This series is an infinite series and is given as follows:

$$f(x) = \sum_{n=0}^{\infty} \frac{f^n(0)}{n!} x^n$$

where $f^n(0)$ is the n^{th} derivative of $f(x)$ evaluated at $x = 0$.

Step 2. Exercise

- It is found that Maclaurin series of $f(x) = x^2 \ln(1 + x)$ is given as below:

$$x^2 \ln(1 + x) = \sum_{n=1}^{\infty} (-1)^{n+1} \frac{x^{n+2}}{n}$$

- Write the first ten terms of this series, $f_{10}(x)$. Notice that the first value of n is 1 NOT 0.
- Plot the original function $f(x)$ for $(0 \leq x \leq 1.5)$. On the same graph, plot $f_{10}(x)$.
- Write an R script that takes the value of x as an input from the user, then compute the value of the series for up to ten terms $n = 10$.
- For each term, find the absolute and relative error.

Your output should look like the following table:

n	Absolute error	Relative error
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		