

# Term Work Assignment-2(TWA2: CO-2)

## Taylor and Maclaurin series

MATHEMATICS-1: BE01R00041

Date: 01-08-25

**Objective:** To expand on the definitions, calculations, and applications of Taylor and Maclaurin series for function approximation and expansion.

### Part 1: Elementary Series

1. **Maclaurin Series Expansion:** Obtain the Maclaurin series for the following functions by finding the general form for the derivatives:

- $f(x) = \sin(x)$
- $f(x) = \cos(x)$
- $f(x) = e^x \log(1 + x)$

2. **Using Known Series:**

- Obtain the Maclaurin series for  $\log\left(\frac{1+x}{1-x}\right)$  by using the series for  $\log(1+x)$  and  $\log(1-x)$ .
- Obtain the Maclaurin series for  $\cos(x^2)$ .

### Part 2: Taylor Series and Approximation

1. **Taylor Expansion:**

- Expand the function  $f(x) = \tan(x)$  in powers of  $(x - \frac{\pi}{4})$ . Show at least four non-zero terms.
- Expand  $\sin(\frac{\pi}{4} + x)$  in powers of  $x$ .

2. **Approximation with Taylor's Theorem:**

- Use the Taylor expansion of  $\sin(\frac{\pi}{4} + x)$  to find the approximate value of  $\sin(44^\circ)$ .
- Use Taylor's Theorem to find the approximate value of  $\sqrt{25.15}$ .
- Given  $\log_{10} 73 = 1.8633$  and  $\log_{10} e = 0.4343$ , use Taylor's Theorem to find the approximate value of  $\log_{10} 73.55$ .
- Find the approximate value of  $\tan^{-1}(1.003)$  using Taylor's Theorem. Use  $\pi = 3.141593$ .

### Part 3: Advanced Problems and Applications

1. **Polynomial Expansion:** Arrange the polynomial  $f(x) = x^3 - 3x^2 + 4x + 3$  in powers of  $(x - 2)$ .

2. **Series for Integrals:** Obtain the Maclaurin series of  $\int \frac{\sin x}{x} dx$ .