

**Assignment for Academic Year 2025-2026 (Session Beginning January 2026)**

**CLASS: BA-2<sup>nd</sup> Year**

**Course Name: Real Analysis**

**Course Code: MATH201TH**

**ASSIGNMENT-1**

Attempt any **TWO** of the following questions:

- Ques 1.** Find real values of  $x$ , which satisfied the inequality  $\frac{x-2}{x+2} > \frac{2x-3}{4x-1}$ .
- Ques 2.** Derive the condition under which  $|a - b| = |a| - |b|$ ;  $a, b \in R$ .
- Ques 3.** Show that 0 is the only limit points of the set  $\left\{\frac{1}{n} : n \in N\right\}$ .
- Ques 4.** Prove that  $\log_{n \rightarrow \infty} \sqrt[n]{n} = 1$ .

**ASSIGNMENT-2**

Attempt any **TWO** of the following questions:

- Ques 1.** Prove that  $\log_{n \rightarrow \infty} \frac{1}{n} \left(1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n}\right) = 0$ .
- Ques 2.** Prove that the sequence  $\{a^n\}$ ,  $a > 1$  is unbounded.
- Ques 3.** Show that  $\sum_{n=1}^{\infty} \frac{1}{n(n+1)} = 1$ .
- Ques 4.** Show that the series  $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$  is convergent.

**ASSIGNMENT-3**

Attempt any **TWO** of the following questions:

- Ques 1.** Discuss the convergence of the series  $\sum_{n=1}^{\infty} \frac{1}{x^n + x^{-n}}$ ,  $x > 0$ .
- Ques 2.** Show that the sequence  $f_n(x) = \frac{x}{1+nx^2}$ ,  $x \in R$  converges uniformly on any closed interval.
- Ques 3.** Show that the series  $\sum_{n=1}^{\infty} \frac{1}{n^2+x^2}$  is uniformly convergence on  $[0, \infty)$ .
- Ques 4.** Find the interval of convergence of the power series  $\sum_{n=2}^{\infty} \left(\frac{1}{\log n}\right) x^n$ .