

North Gauhati College
Department of Mathematics

SEMESTER III(HONOURS)
ASSIGNMENT II

MAT-HC-3016
Theory of Real Functions

August 2021

TOTAL MARKS: 25

INSTRUCTIONS TO CANDIDATES

1. This assignment paper contains **Seven (7)** questions and comprises **Two (2)** printed pages.
2. Each question carry **Five** marks. Answer any **Five** of all questions.
3. Submit the assignment as a single **PDF** file through the online portal of our college website under section “Assignments” and send a copy to the email id mathngc1969@gmail.com.
4. Write your **Name**, **GU Roll No.**, and **Registration Number** in the assignment .
5. Submission **Due Date** is on or before **10th August, 2021**.

(Answer any **Five**)

1. State and prove Rolle's theorem.

2. Examine the differentiability of

$$f(x) = |x| + |x - 1|$$

at $x = 0$.

3. State and prove Darboux's theorem.

4. Find the values of a , b , c so that

$$\text{Lt}_{x \rightarrow 0} \frac{a + b \cos x + c \sin x}{x^2}$$

exists and equal to $\frac{1}{2}$.

5. Prove that continuity is a necessary condition for the existence of finite derivative of a function. Show with an example that the condition is not sufficient.

6. If $\text{Lt}_{x \rightarrow a} f(x)$ exists, then prove that it must be unique. Evaluate

$$\text{Lt}_{x \rightarrow 0} \frac{\sqrt{4+x} - 2}{x}.$$

7. Verify Cauchy's Mean Value theorem for the function $f(x) = \sin x$ and $g(x) = \cos x$ in $[-\frac{\pi}{2}, 0]$.

END OF PAPER