

Assignment 1
Subject: Mathematics
3rd Semester (MAJOR)
Paper: MAT-HC-3016
(Theory of Real Functions)

Full Marks: 25

Instruction: After completing your assignment, save it as pdf and name it as “NAME_RollNo_3016(A1)_major” and then mail it to mathematics.adp.2021@gmail.com . Here, type your name and roll no in the place of NAME and RollNo while naming the file.

1. Answer the following questions:

2.5 x 4 = 10

- a. Find the set of limit points of the interval $[200,300]$.
- b. The set of limit points of a set is closed. Is the statement True or False? Give reason to justify your answer.
- c. Let $f: \mathbf{R} \rightarrow \mathbf{R}$ be a function such that $f(x) = \tan(x)$. Find the limit (if exist) of $f(x)$ at $x = \pi/2$. Also, find the right hand limit and left hand limit of $f(x)$ at $x = \pi/2$.
- d. Define the limit of a function (ϵ - δ approach). Define sequential criteria for continuity of a function. Give examples for both the definitions.

2. Answer the following questions:

5 x 3 = 15

- a. State and prove Darboux's theorem.
- b. State and prove Taylor's theorem.
- c. State and prove the Intermediate Value Theorem.

Assignment 2
Subject: Mathematics
3rd Semester (MAJOR)
Paper: MAT-HC-3016
(Theory of Real Functions)

Full Marks: 25

Instruction: After completing your assignment, save it as pdf and name it as “NAME_RollNo_3016(A2)_major” and then mail it to mathematics.adp.2021@gmail.com . Here, type your name and roll no in the place of NAME and RollNo while naming the file.

1. Answer the following questions:

2.5 x 4 = 10

a. State True or False with reason. If $\lim_{x \rightarrow \infty} f(x) = 0 = \lim_{x \rightarrow \infty} g(x)$, then

$$\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)} = 0, \forall f(x) \text{ and } g(x) \text{ being a real valued function.}$$

b. Define Cluster Point of a Set. Support your answer with examples.

c. Define differentiability of a function in an interval. Give an example of a function which is differentiable in an interval except at five points of that interval.

d. State the preservation of intervals theorem.

2. Answer the following questions:

5 x 3 = 15

a. State and prove the Maximum-Minimum theorem.

b. State and prove the Location of roots theorem.

c. State and prove the Cauchy mean value theorem.