

**HOME ASSIGNMENT (2023)**  
Directorate of Open and Distance Learning  
Dibrugarh University

**Subject: M.A./M.Sc. in Mathematics Programme**  
**(First Semester)**

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**Course: MATH-101**  
**Real Analysis**

Assignment 1 (5+5)

- (i) Examine whether interior and closure of connected set are connected.
- (ii) Establish the Cauchy criterion for uniform convergence of a sequence of functions.

Assignment 2 (5+5)

- (i) Justify that uniform limit of a sequence of continuous functions is continuous.
  - (ii) What is complete metric space? Show that a subspace of a complete metric space is complete if it is closed.
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**Course: MATH-102**  
**Algebra and Logic**

Assignment 1 (5+5)

- (i) State and prove the Sylow's First Theorem.
- (ii) Prove that group of order 15 and 35 are cyclic.

Assignment 2 (5)

- (i) What is tautology? Examine whether the following is a tautology.  
$$(P \rightarrow Q) \leftrightarrow (\sim P \vee Q)$$

- (ii) (5)  
Briefly explain the notion of 'adequate set of connectives'.
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**Course: MATH-103**  
**Differential Geometry**

Assignment 1 (10)

- (i) Define a surface and prove that the property of being an ordinary point is unchanged by a proper parametric transformation.

Assignment 2 (10)

- (i) Discuss the geometrical interpretation of the second fundamental form.
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**Course: MATH-104**  
**Mechanics**

Assignment 1 (5+5)

- (i) Derive Euler's dynamical equations of motion.
- (ii) Discuss torque-free motion of a rigid body.

Assignment 2 (5+5)

- (i) State and prove Jacobi's identity.
  - (ii) Express Hamilton equation of motion in terms of Poisson brackets.
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