"Education for Knowledge, Science, and Culture"
- Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College, Kolhapur

(An Empowered Autonomous Institute)

KOLHAPUR

DEPARTMENT OF MATHEMATICS

Date: 08/02/2025

Notice-Seminar

It is hereby informed to all the students of B.Sc.-III(Mathematics) that the seminars are scheduled on Friday, 21st and Saturday, 22nd February 2025 at 11:00 AM. The seminar topics are allotted to all students as per the table below:

Sr. No.	Roll No.	Student Name	Topic of Seminar
1	8249	ARDALKAR ADITYA ASHOK	Properties and Convergence in Real Analysis
2	8250	BHOGAM SUJATA KRISHNAT	Limit Superior, Limit Inferior, and Cauchy Sequences
3	8251	BHOSALE AASHA SADIK	Ratio, Root, and Alternating Series
4	8252	CHOUGULE PRATEEK ANIL	Conditions and Properties of Integrable Functions
5	8253	CHOUGULE VISHAKHA MAHADEV	Tests for Convergence and Absolute Convergence
6	8254	GANBAVALE TEJAS SANTOSH	Definitions, Examples, and Cyclic Groups in Abstract Algebra
7	8255	JADHAV SHRIDHAR SUHAS	Normal subgroups, quotient groups
8	8256	KALAKE ABHIJEET LAXMAN	Structures and Homomorphisms
9	8257	KALAMKAR SANIKA JAYVANT	Elimination of Arbitrary Constants and Functions
10	8258	KAMBLE AVISHKAR SUDESH	Charpit's Method and Singular Integrals
11	8259	MORE PRANALI ASHOK	Complementary Functions and Particular Integrals
12	8260	PATIL ARPITA JINESHWAR	Lagrange and Newton's Divided Differences
13	8261	SAJNIKAR DIVYA NETAJI	Trapezoidal, Simpson's 1/3rd, and 3/8th Rules
14	8262	VADICHARLA SANDHYA KRUSHNAMURTI	Euler and Runge-Kutta Methods

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(Mr. S. P. Thorat)
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DEPARTMENT OF MATHEMATICS
VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)

Vivekanand College, Kolhapur

(An Empowered Autonomous Institute)

Department of Mathematics

Attendance-Seminar

Sr. No.	Roll No.	Student Name	Sign 21/02/2025	Sign 22/02/2025
1	8249	ARDALKAR ADITYA ASHOK	[signature]	
2	8250	BHOGAM SUJATA KRISHNAT	[signature]	
3	8251	BHOSALE AASHA SADIK	[signature]	
4	8252	CHOUGULE PRATEEK ANIL	[signature]	
5	8253	CHOUGULE VISHAKHA MAHADEV	[signature]	
6	8254	GANBAVALE TEJAS SANTOSH		[signature]
7	8255	JADHAV SHRIDHAR SUHAS		[signature]
8	8256	KALAKE ABHIJEET LAXMAN	[signature]	
9	8257	KALAMKAR SANIKA JAYVANT	[signature]	
10	8258	KAMBLE AVISHKAR SUDESH		[signature]
11	8259	MORE PRANALI ASHOK		[signature]
12	8260	PATIL ARPITA JINESHWAR		[signature]
13	8261	SAJNIKAR DIVYA NETAJI		[signature]
14	8262	VADICHARLA SANDHYA KRUSHNAMURTI		[signature]

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Properties and Convergence in Real Analysis

ARDALKAR ADITYA ASHOK
Roll No: 8249
B.Sc.-III (Mathematics)

Vivekanand College, Kolhapur (An Empowered Autonomous Institute)

21 February 2025

Outline

Introduction to Real Analysis

- Study of real numbers and their properties.
- Focus on sequences, series, and integrals.
- Key concepts: Convergence, boundedness, and monotonicity.

Properties of Sequences

- **Bounded Sequence**: A sequence where all terms lie within finite bounds.
- **Monotone Sequence**: Either non-decreasing or non-increasing.
- **Convergent Sequence**: Approaches a limit as $n \to \infty$.
- **Cauchy Sequence**: Terms become arbitrarily close.

Convergence of Sequences

- Limit superior and limit inferior.
- Example: $a_n = \frac{1}{n}$ converges to 0.
- Divergent sequence: $a_n = n$ grows without bound.

Convergence of Series

- Series with non-negative terms.
- Alternating series and absolute convergence.
- Example: $\sum(-1)^n \frac{1}{n}$ (conditional convergence).

Riemann Integrability

- Integrability of bounded functions over a finite domain.
- Darboux's theorem (statement only).
- Properties of integrable functions.

Convergence of Improper Integrals

- Definition and test for convergence at a point.
- Example: $\int_1^\infty \frac{1}{x^2}\,dx$ converges.
- Absolute and conditional convergence.

Conclusion

- Convergence is central to real analysis.
- Sequences, series, and integrals rely on these properties.
- Applications in advanced mathematics and physics.

References

- Richard R. Goldberg, Method of Real Analysis, Oxford and IBH Publishing.
- Shanti Narayan and P. K. Mittal, A Course of Mathematical Analysis, S. Chand.

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Charpit's Method and Singular Integrals

KAMBLE AVISHKAR SUDESH
Roll No: 8258
B.Sc.-III (Mathematics)
22 February 2025

Outline

1. Introduction
2. Charpit's Method
3. Singular Integrals
4. Examples and Applications

Introduction to Non-Linear PDEs

- Non-linear partial differential equations (PDEs) of order one.
- Charpit's Method: Solves $f(x, y, z, p, q) = 0$ where $p = \frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$.
- Singular Integrals: Unique solutions as envelopes of integral surfaces.

Overview of Charpit's Method

- Based on auxiliary equations: $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{Rp+Sq}$.
- Derives complete, particular, and singular integrals.
- Geometrical interpretation of solution surfaces.

Steps and Example

- Formulate characteristic equations from $f(x, y, z, p, q) = 0$.
- Solve for singular integral directly.
- Example: $p^2 + q^2 = 1$ yields a cylindrical surface solution.

Definition and Properties

- Singular Integral: Envelope of the family of integral surfaces.
- Differs from complete integral with arbitrary functions.
- Arises from unique constraints in the PDE.

Geometric Interpretation

- Represents the boundary of solution surfaces.
- Example: $z = ax + \frac{b}{a}$ yields a singular integral under envelope conditions.
- Applications in envelope curves and physical systems.

Worked Example

- Solve $p + q = pq$ using Charpit's Method.
- Auxiliary equations lead to $z = x + y + \log(1 - x - y)$ as a singular integral.
- Application in wave propagation envelope solutions.

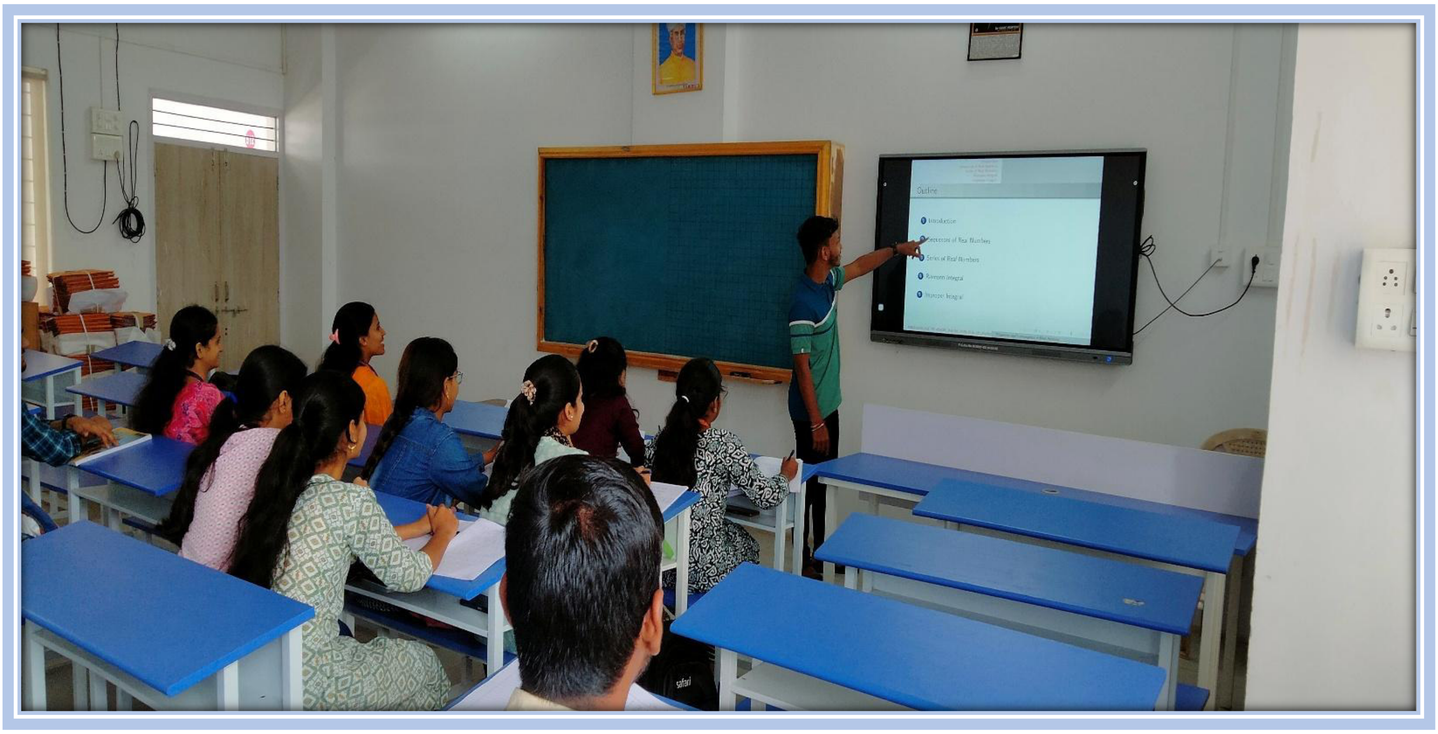
Conclusion

- Charpit's Method provides a systematic approach to non-linear PDEs.
- Singular Integrals offer geometric and analytical insights.
- Relevant in mathematical modeling and differential geometry.

References

- Dr. M. D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand.
- IAN N. SNEDDON, Elements of Partial Differential Equations, Dover Publications.
- Daniel A. Murray, Introductory Course in Differential Equations, Khosla Publishing House.


Introduction to Non-Linear PDEs
Non-linear partial differential equations (PDEs) of order one
Singular Integrals: Unique solutions as envelopes of integral surfaces


Outline
Introduction
Series of Real Numbers
Riemann Integral
Improper Integral