



CALCULUS AND ITS APPLICATION IN ECONOMICS AND BUSINESS

Editor

Dr. Sujay Kumar Nayek



Dr. Sujay Kumar Nayek is currently working as an Assistant Professor in the Department of Mathematics, Netaji Nagar Day College, Kolkata 700092, West Bengal, India. He obtained his Ph.D. degree in Mathematics from The University of Burdwan, West Bengal. He has also a Post Doctoral Research experience under NBHM fellowship. His research interests include atomic collision phenomena under plasma environments, bound states, energy calculations, development of theoretical models for structure calculations of atoms and molecules under various types of confinements. He participated in many national/international seminars, conferences and workshops in different Universities. He has published a good number of research articles in leading international journals and conference proceedings.

Key Features:

- The book chapters are written in accordance with CBCS syllabus for the students of Economics and Commerce at the undergraduate level.
- Each chapter is written by the experienced teachers.
- Many examples, short type and multiple choice questions and answers are given at the end of each chapter.
- Figures of different curves are provided.



Publisher:

NETAJI NAGAR DAY COLLEGE

170/436, N. S. C. Bose Road, Regent Estate

Kolkata 700092, West Bengal, India

Website: www.nndc.ac.in

Email: netajinagardaycollege@gmail.com

ISBN No.: 978-81-956899-0-3

Printer: Rohini Nandan, 19/2, Radhanath Mallick Lane,

Kolkata 700012, W.B., India

Website: www.rohininandan.com

ISBN: 978-81-956899-0-3



Price: ₹400/-

Calculus and Its Application in Economics and Business

Editor

Dr. Sujay Kumar Nayek

M.Sc. & Ph.D. in Mathematics

Assistant Professor

Department of Mathematics

Netaji Nagar Day College

Kolkata 700092, West Bengal



Publisher: Netaji Nagar Day College
170/436, N. S. C. Bose Road, Regent Estate
Kolkata 700092, West Bengal, India

Book Title: Calculus and Its Application in Economics and Business;

Publisher: Netaji Nagar Day College; ISBN: 978-81-956899-0-3

Contents

Chapter 1: Basic Aspects of Set Theory [Page 1-52]

- 1.1 Introduction
- 1.2 Meaning and Definition of Sets
- 1.3 Presentation of Sets
- 1.4 Types of sets
- 1.5 A Few Relations between Sets
- 1.6 Operations on Sets
- 1.7 Venn Diagram
- 1.8 Fundamental Laws of Algebra of Sets
- 1.9 Analytical Proofs of Some Basic Laws
- 1.10 Principle of Duality
- 1.11 Partition of a Set
- 1.12 Ordered Pair and Cartesian Product of Sets
- 1.13 Number of Elements in a Set
- 1.14 Relation
- 1.15 Functions or Mappings
- 1.16 Difference between Relations and Functions
- 1.17 Binary Operations or Binary Composition
- 1.18 Application of Set Theory in Business
- 1.19 Miscellaneous Workout Examples
- 1.20 Multiple Choice Questions
- 1.21 References

Chapter 2: Real Functions [Page 53-64]

- 2.1 Introduction
- 2.2 Real Valued Functions

Book Title: Calculus and Its Application in Economics and Business;

Publisher: Netaji Nagar Day College; ISBN: 978-81-956899-0-3

- 2.3 Some Important Functions
- 2.4 Classification of Functions
- 2.5 Graphical Representation of Some Functions
- 2.6 Example of Some Parametric Curves
- 2.7 Solved Problems
- 2.8 References

Chapter 3: Limit and Continuity [Page 65-85]

- 3.1 Introduction
- 3.2 Limit of Variable
 - 3.2.1 Geometrical Presentation of the limit of a variable
 - 3.2.2 Meaning of $x \rightarrow \infty$ and $x \rightarrow -\infty$
 - 3.2.3 Limit of a Function
 - 3.2.4 More Precise Definition of Limit ($\epsilon - \delta$ definition)
 - 3.2.5 Cauchy's Criterion of Finite Limit
- 3.3 Algebra of Limits
 - 3.3.1 Limit of a Polynomial
 - 3.3.2 Limit of a Rational Function
- 3.4 Continuity of Functions
 - 3.4.1 Continuity of Polynomials and Rational Functions
 - 3.4.2 Discontinuous Functions
- 3.5 Theorems on Continuity
- 3.6 Uniform Continuity
- 3.7 Multiple Choice Questions
- 3.8 References

Chapter 4: **Application of Derivative and Integration**

[Page 86-122]

4.1 Introduction

4.2 Precognition

4.2.1 Limit of a Function

4.2.2 Continuity of a Function

4.2.3 Derivative of a Function

4.2.4 Integration

4.2.5 Monotone Functions

4.2.6 Maxima and Minima

4.3 Basic Terms of Economics

4.3.1 Production

4.3.2 Cost and Price

4.3.3 Cost Function

4.3.4 Revenue Function

4.3.5 Profit Function and Break-even Point

4.3.6 Demand Function

4.3.7 Supply Function

4.3.8 Demand-Supply Equilibrium

4.4 Advantage and Marginal Functions

4.4.1 Average and Marginal Cost

4.4.2 Average and Marginal Revenue

4.4.3 Average and Marginal Profit

4.4.4 Workout Examples

4.5 Optimization of Functions

4.5.1 Minimization of Cost

4.5.2 Maximization of Revenue

4.5.3 Workout Examples

4.6 Determination of a Function from Its Marginal

Book Title: Calculus and Its Application in Economics and Business;

Publisher: Netaji Nagar Day College; ISBN: 978-81-956899-0-3

Value

- 4.6.1 Determination of Cost
- 4.6.2 Determination of Revenue and Profit
- 4.6.3 Workout Examples
- 4.7 Exercises
- 4.8 References

Chapter 5: Integration [Page 123-147]

- 5.1 Introduction
- 5.2 Integration as Anti-Derivative Process
- 5.3 Graphical Significance
- 5.4 Rule of Integration
 - 5.4.1 Some standard formulas for Integration
 - 5.4.2 Integration by Substitution
 - 5.4.3 Some Standard Integrals
- 5.5 Area Enclosed by Plane Curves Using Integration Formula
- 5.6 Solved Problems
- 5.7 Applications of Integration in Commerce
- 5.8 Multiple Choice Questions
- 5.9 Exercises
- 5.10 References

Chapter 6: Matrix [Page 148-172]

- 6.1 Introduction
- 6.2 Definition
 - 6.2.1 Type of Matrices
 - 6.2.2 Equality of two matrices
- 6.3 Operations on Matrices

Book Title: Calculus and Its Application in Economics and Business;

Publisher: Netaji Nagar Day College; ISBN: 978-81-956899-0-3

- 6.4 Adjoint of a Matrix
- 6.5 Inverse of a Matrix
- 6.6 Definition and Examples of Different Kind of Matrices
- 6.7 Solution of a System of Linear Equations by Matrix Method
- 6.8 Applications of Matrix Method in Business
- 6.9 Rank of a Matrix
- 6.10 Exercises
- 6.11 References

Chapter 7: Determinants

[Page 173-201]

- 7.1 Introduction
- 7.2 Determinants and Its Presentation
- 7.3 Some Basic Results
- 7.4 Workout Examples
- 7.5 Symmetric and Skew-Symmetric Determinants
- 7.6 Cofactors and Minors
- 7.7 Laplace's Method for Evaluating Determinants
- 7.8 Multiplication of Determinants
- 7.9 Cramer's Rule
- 7.10 Application of Determinants to Co-ordinate Geometry
- 7.11 Multiple Choice Questions
- 7.12 References