

BARBARA BATÓG
BEATA BIESZK-STOLORZ
IWONA FORYŚ
MAŁGORZATA GUZOWSKA
KRZYSZTOF HEBERLEIN

Mathematics

**FOR STUDENTS OF ECONOMICS
FINANCE AND MANAGEMENT**

Difin

Table of Contents

Preface	9
---------	---

Chapter 1	
INITIAL ISSUES	11
1.1. Logical sentences and their properties	11
1.2. Propositional function. Quantifiers	12
1.3. Set algebra	13
1.4. Cartesian product	16
1.5. Relations	18
1.6. Functions	21
1.7. Operations and groups	24
1.8. Vector space and its properties	27

Chapter 2	
MATRICES	35
2.1. Matrix definition and types	35
2.2. Operations on matrices	37
2.3. The determinant of a square matrix	42
2.4. Inverse matrix	47
2.5. The rank of a matrix	51
2.6. Matrix equations	53

Chapter 3	
SYSTEMS OF LINEAR EQUATIONS	57
3.1. Definition and types of systems of linear equations	57
3.2. Cramer's system (Cramer's rule)	58

3.3. Methods of solving systems of linear equations	59
3.4. Homogeneous systems of linear equations	63
3.5. Gaussian elimination	64
3.6. Eigenvalues of matrices	70
3.7. Quadratic forms	73

Chapter 4

LIMITS AND CONTINUITY	80
4.1. Metric space	80
4.2. Sequences and their properties	82
4.3. Limits of sequences	84
4.4. Limits and continuity of functions	90
4.5. Asymptotes	105

Chapter 5

DERIVATIVE OF A FUNCTION AND ITS APPLICATIONS	109
5.1. Derivative and differential of functions	109
5.2. Monotonicity and extrema of functions	120
5.3. Concavity and inflection points	132
5.4. L'Hospital's rule	138
5.5. Sketching graphs of functions	141

Chapter 6

FUNCTIONS OF MANY VARIABLES AND THEIR EXTREMA	150
6.1. Definition of a function of many variables	150
6.2. Partial derivatives	156
6.3. Higher-order partial derivatives	159
6.4. Total differential	162
6.5. Extrema of functions of many variables	167
6.6. Constrained (conditional) extrema	175

Chapter 7

INTEGRAL CALCULUS	179
7.1. Indefinite integral and its properties	179
7.2. Integration by substitution	181
7.3. Integration by parts	182
7.4. Integration of rational functions	183

7.5. Definite integral and its properties	189
7.6. Application of definite integral	193
7.7. Improper integrals	196

Chapter 8

APPLICATIONS IN ECONOMICS, FINANCE, AND MANAGEMENT	199
8.1. Application of systems of linear equations	199
8.2. Application to input-output analysis in economics – Leontief model	201
8.3. The market(s) model and national income models	205
8.4. Elements of financial mathematics	210
8.5. Application of differential calculus	211
8.6. Application of integral calculus	224

Appendix 1

ELEMENTARY FUNCTIONS AND THEIR PROPERTIES	227
--	-----

Appendix 2

SPECIAL MATHEMATICAL FORMULAS	236
--------------------------------------	-----

Index	243
--------------	-----

References	251
-------------------	-----