

## Contents

<b>Introduction</b> .....	2
<b>I. Linear algebra</b> .....	4
I.1. Vector spaces .....	4
I.2. Matrices and determinants .....	9
I.3. Systems of linear algebraic equations .....	17
I.4.* Linear mapping of $\mathbb{R}^n$ into $\mathbb{R}^m$ .....	21
I.5. Eigenvalues and eigenfunctions of square matrices .....	26
I.6. Survey of equivalent properties of a square matrix .....	29
<b>II. Analytic geometry in <math>\mathbb{E}_3</math></b> .....	30
II.1. Some basic notions .....	30
II.2. Straight lines in $\mathbb{E}_3$ .....	32
II.3. Planes in $\mathbb{E}_3$ .....	35
II.4.* Quadric surfaces in $\mathbb{E}_3$ .....	39
<b>III. Differential calculus</b> .....	46
III.1. Sequences of real numbers .....	47
III.2. Functions – basic notions .....	51
III.3. Limits and continuity of a function .....	56
III.4. Derivative of a function .....	62
III.5. Applications of derivatives, behavior of a function .....	69
III.6. The osculating circle, Taylor's theorem .....	80
III.7. Parametric representation of functions .....	83
III.8. Approximate solution of a nonlinear equation $f(x) = 0$ .....	86
III.9. Complex and vector-valued functions of a real variable .....	90
<b>IV. Indefinite integral</b> .....	92
IV.1. Antiderivative, indefinite integral .....	92
IV.2. Integration by parts .....	95
IV.3. Integration by substitution .....	97
IV.4. Integration of simple rational functions .....	100
IV.5. Integration of functions of the type $\sin^n x \cdot \cos^m x$ .....	106
IV.6. Integration of some other types of functions .....	107
IV.7. Separable differential equations .....	111
<b>V. Definite (Riemann's) integral</b> .....	116
V.1. Historical approach .....	116
V.2. Definition of the Riemann integral .....	119
V.3. Important properties of the Riemann integral .....	122
V.4. Evaluation of the Riemann integral .....	125
V.5. Numerical integration .....	127
V.6. The improper integral .....	129
V.7. Some geometrical and physical applications of the definite integral ..	132
Bibliography .....	134
Index + Vocabulary .....	135
List of selected symbols .....	141