

Product integration. Its history and applications

Table of contents

In: Antonín Slavík (author): Product integration. Its history and applications. (English). Praha: Matfyzpress, 2007. pp. [iii]–[iv].

Persistent URL: <http://dml.cz/dmlcz/401130>

Terms of use:

© Antonín Slavík

Institute of Mathematics of the Czech Academy of Sciences provides access to digitized documents strictly for personal use. Each copy of any part of this document must contain these *Terms of use*.



This document has been digitized, optimized for electronic delivery and stamped with digital signature within the project *DML-CZ: The Czech Digital Mathematics Library* <http://dml.cz>

Table of contents

Preface	1
Chapter 1. Introduction	3
1.1 Ordinary differential equations in the 19th century	3
1.2 Motivation to the definition of product integral	7
1.3 Product integration in physics	9
1.4 Product integration in probability theory	9
Chapter 2. The origins of product integration	13
2.1 Product integration in the work of Vito Volterra	15
2.2 Basic results of matrix theory	16
2.3 Derivative of a matrix function	19
2.4 Product integral of a matrix function	22
2.5 Continuous matrix functions	32
2.6 Multivariable calculus	39
2.7 Product integration in complex domain	51
2.8 Linear differential equations at a singular point	59
Chapter 3. Lebesgue product integration	65
3.1 Riemann integrable matrix functions	66
3.2 Matrix exponential function	71
3.3 The indefinite product integral	74
3.4 Product integral inequalities	76
3.5 Lebesgue product integral	79
3.6 Properties of Lebesgue product integral	83
3.7 Double and contour product integrals	91
3.8 Generalization of Schlesinger's definition	95
Chapter 4. Operator-valued functions	99
4.1 Integral operators	100
4.2 Product integral of an operator-valued function	102
4.3 General definition of product integral	108
Chapter 5. Product integration in Banach algebras	111
5.1 Riemann-Graves integral	112
5.2 Definition of product integral	114
5.3 Useful inequalities	116
5.4 Properties of product integral	118
5.5 Integrable and product integrable functions	122
5.6 Additional properties of product integral	127
Chapter 6. Kurzweil and McShane product integrals	131
6.1 Kurzweil and McShane integrals	132

6.2	Product integrals and their properties	133
Chapter 7. Complements		139
7.1	Variation of constants	139
7.2	Equivalent definitions of product integral	140
7.3	Riemann-Stieltjes product integral	142
Bibliography		145