



BUSINESS MATHEMATICS
A COMPIATION

St. Gabriel's Library, Au

BUSINESS MATHEMATICS

A COMPILATION

BANCHSA SAENGHIRAN

Assumption Business Administration College



ABAC Press

**Assumption Business Administration College,
Ramkhamhaeng 24, Huamark, Bangkok 10240,
Thailand.**

513.93
B213b
1983
3904 c.2
21 May 2005

Student Edition

To
The Brothers of St. Gabriel in Thailand and
Assumption Business Administration College

"Mathematics may be defined as the subject in which we never know what we are talking about, nor whether what we are saying is true."

Bertrand Russell.

PREFACE

This text is meant mainly for the students of Assumption Business Administration College (ABAC), often at the freshman level. It is a compilation of business topics from various books. The emphasis is on the business transactions and business models. It serves as a basis for decision making and for higher studies.

Throughout the book, practical problems are used to illustrate the application of the formulas and tables. This is particularly helpful to students who have a limited knowledge of algebra, and self-study would be much enhanced by exercises and given answers to the problems presented at the end of each topic or chapter.

The currencies used may be in baht or U.S. dollars and the interest rates used may be a little obsolete. But the approach to the problems would be the same regardless of these differences.

This is a one-semester course in Business Mathematics. The instructor is free to organize the sequence of the subject matters in the most suitable way. Omission or addition of certain topics may be done. The text is meant as a guideline for both the instructor and the students. The course can be developed into a two-semester course later on with more contents.

I wish to express my appreciation to the administrators of Assumption Business Administration College in general, and its staff members and students in particular who have encouraged me to undertake this piece of work and through the available sources rendering it to reach its completion.

I am indebted to Suda Kittikorncharoen and Chaiyong Truakul for their constant push towards its publication.

I am grateful to Songsamorn Chomchinda who had helped me to type the rough and final draft. Thanks are extended also to the following for their kind help in the production of the book: Narin Chomchinda, Rapeepan Suk-asa, and Decha Sethapun.

Bancha Saenghiran

CONTENTS

Preface	i
Chapter 1 Simple Interest	1
1.1 Simple Interest	1
1.2 Future Value	3
1.3 Exact and Ordinary Interest	8
1.4 Exact and Approximate Time	9
1.5 Commercial Practice	10
1.6 Present Value at Simple Interest	16
Chapter 2 Compound Interest	18
2.1 Derivation of Compound Formula	18
2.2 Cash-Flow Diagram	23
2.3 Use of Interest Tables	27
2.4 Continuous Compounding	33
2.5 Effective Interest Rates	37
Chapter 3 Annuities	42
3.1 Amount of an Ordinary Annuity	42
3.2 Present Value of an Ordinary Annuity	48
3.3 Extension of Tables	52
3.4 Annuity Due	55
3.5 Present Value of an Annuity Due	56
3.6 Deferred Annuity	64
Chapter 4 Inequalities and Linear Programming	71
4.1 Nature of Inequalities	71
4.2 Inequality — Preserving Operations	72
4.3 Solution of Inequalities	74
4.4 Application of Inequalities	79
4.5 Systems of Linear Inequalities	80
4.6 Absolute Value	88
4.7 Linear Programming	94
4.8 Applications of Equations	110

Chapter 5	Function	117
5.1	Types of Function	120
5.2	Combinations of Functions	122
5.3	Applications of Linear Functions	124
5.4	Inverse Functions	141
5.5	Exponential Function	145
5.7	Logarithmic Function	152
Chapter 6	Straight Line	158
6.1	Lines	158
6.2	Point — Slope Form	161
6.3	Slope — Intercept Form	162
6.4	Linear Function	164
6.5	Systems of Linear Equations	169
6.6	Nonlinear Systems	173
6.7	Applications of Systems of Equations	174
Chapter 7	Limits and Continuity	187
7.1	Limits of Functions	187
7.2	Properties of Limits	192
7.3	Function as x approaches 0	195
7.4	Continuity	205
Chapter 8	The Derivative	214
8.1	The Slope of a Curve	214
8.2	Rules for Differentiation	222
8.3	Implicit Differentiation	242
8.4	The Derivative as a Rate of Change	247
8.5	Higher — Order Derivatives	262
Chapter 9	Applications of Differentiation	269
9.1	Intercepts and Symmetry	269
9.2	Asymptotes	274
9.3	Maxima and Minima	280
9.3.1	First — Order Condition	283
9.3.2	The Second — Derivative Test	292
9.4	Concavity	296
9.5	Inflection Point	301

9.6	Curve Sketching	302
9.7	Applied Maxima and Minima	305
9.8	Partial Derivatives	325
9.9	Mixed Partial Derivatives	327
9.10	Interpretation of Partial Derivatives	330
9.11	Maxima and Minima of Functions of Several Variables	334
Chapter 10	Integration	343
10.1	The Indefinite Integral	344
10.2	Rules of Integration	344
10.3	Definite Integrals	358
10.4	Area	363
10.5	Area between Curves	367
Chapter 11	Applications of Integration	380
11.1	Continuous Compounding	380
11.2	Present Value of an Annuity if Continuous Compounding	384
11.3	Economic Applications	387
11.3.1	Marginal and Total Cost Functions	387
11.3.2	Revenue	390
11.3.3	Maintenance Expenditures	391
11.3.4	Fund Raising	392
11.3.5	Nuclear Power	393
11.4	Consumer's and Producer's Surplus	395
11.5	Maximizing Profit over Time	406
11.6	The Learning Curve	409
11.7	The New Product Application	411
11.8	Advertising Effectiveness	412
11.9	A Production Problem	415
Appendixes		421
A	Table of the Number of each day of the year	423
B	Compound Interest Table Values of $(1 + i)^n$	424
C	Compound Interest Table Values of $(1 + i)^{-n}$	440

D	Annuity Table Values of $S_{\overline{n} i}$	456
E	Annuity Table Values of $a_{\overline{n} i}$	472
F	Annuity Table Values of $\frac{1}{S_{\overline{n} i}}$	488
G	Table of Present Worth of 1 And Present Worth of 1 period for High Rates	494
H	Table of Common Logarithm	498
I	Table of Natural Logarithm	502
J	Table of E^x and E^{-x}	504
K	Bibliography	510
	Answers to Some of the Problems	513