

Contents

1	Introduction to Probability	3
1.1	The History of Probability	3
1.2	Interpretations of Probability	3
1.3	Experiments & Events	3
1.4	Set Theory	3
2	Conditional Probability	3
2.1	The Definition of Conditional Probability	3
2.2	Independent Events	3
2.3	Baye's Theorem	3
2.4	The Gambler's Ruin Problem	3
3	Metric Spaces	3
3.1	Definition of Metric Spaces. Examples	3
3.2	Convergent Sequences	3
3.3	Completeness	3
3.4	Compactness	3
3.5	Connectedness	3
4	Continuous Functions	3
4.1	Definition of Continuity. Examples	3
4.2	Continuity and Limits	3
4.3	The Continuity of Rational Operations. Functions with values in E^n	3
4.4	Continuous Functions on a Compact Metric Space	3
4.5	Continuous Functions on a Connected Metric Space	3
4.6	Sequences of Functions	3
5	Differentiation	3
5.1	Definition of the Derivative	3
5.2	Rules of Differentiation	3
5.3	The Mean Value Theorem	3
5.4	Taylor's Theorem	3
6	Riemann Integration	3
6.1	Definition and Examples	3
6.2	Linearity and Order Properties of the Integral	3
6.3	Existence of the Integral	3
6.4	The Fundamental Theorem of Calculus	3
6.5	The Logarithmic and Exponential Functions	3
6.6	Definition of Continuity. Examples	3

7	Interchange of Limit Operations	3
7.1	Integration and Differentiation of Sequences of Functions	3
7.2	Infinite Series	3
7.3	Power Series	3
7.4	The Trigonometric Functions	3
7.5	Differentiation under the Integral Sign	3
8	The Method of Successive Approximations	3
8.1	The Fixed Point Theorem	3
8.2	The Simplest Case of the Implicit Function Theorem	3
8.3	Existence and Uniqueness Theorems for Ordinary Differential Equations	3
9	Partial Differentiation	3
9.1	Definitions and Basic Properties	3
9.2	Higher Derivatives	3
9.3	The Implicit Function Theorem	3
10	Multiple Integrals	3
10.1	Riemann Integration on Closed Intervals of E^n . Examples and Basic Properties	3
10.2	Existence of the Integral. Integration on Arbitrary Subsets of E^n . Volume	3
10.3	Iterated Integrals	3
10.4	Change of Variable	3

1 Introduction to Probability

1.1 The History of Probability

1.2 Interpretations of Probability

1.3 Experiments & Events

1.4 Set Theory

The Definition of Probability

Finite Sample Spaces

Counting Methods

Combinatorial Methods

Multinomial Coefficients

The Probability of a Union of Events

Statistical Swindles

Supplementary Exercises

2 Conditional Probability

2.1 The Definition of Conditional Probability

2.2 Independent Events

2.3 Baye's Theorem

2.4 The Gambler's Ruin Problem

3 Metric Spaces

3.1 Definition of Metric Spaces. Examples

3.2 Convergent Sequences

3.3 Completeness

3.4 Compactness

3.5 Connectedness

4 Continuous Functions

4.1 Definition of Continuity. Examples

4.2 Continuity and Limits

4.3 The Continuity of Rational Operations. Functions with values in E^n

4.4 Continuous Functions on a Compact Metric Space

4.5 Continuous Functions on a Connected Metric Space

4.6 Sequences of Functions