

Contents

<i>Preface</i>	vii
<i>Special Symbols</i>	xi
1. Introduction	1
1.1 Historical notes	1
1.2 Preliminaries	6
1.3 t-norms and s-norms	9
1.4 Copulas	17
2. Representation theorems for associative functions	23
2.1 Continuous, Archimedean t-norms	23
2.2 Additive and multiplicative generators	38
2.3 Extension to arbitrary closed intervals	51
2.4 Continuous, non-Archimedean t-norms	57
2.5 Non-continuous t-norms	64
2.6 Families of t-norms	70
2.7 Other representation theorems	81
2.8 Related functional equations	93
3. Functional equations involving t-norms	99
3.1 Simultaneous associativity	99
3.2 n -duality	110
3.3 Simple characterizations of Min	127
3.4 Homogeneity	129
3.5 Distributivity	134

3.6	Conical t-norms	137
3.7	Rational Archimedean t-norms	143
3.8	Extension and sets of uniqueness	151
4.	Inequalities involving t-norms	173
4.1	Notions of concavity and convexity	173
4.2	The dominance relation	182
4.3	Uniformly close associative functions	189
4.4	Serial iterates and n -copulas	194
4.5	Positivity	203
Appendix A	Examples and counterexamples	209
Appendix B	Open problems	219
	<i>Bibliography</i>	223
	<i>Index</i>	235