1 Boolean Logic cheatsheet

Table 1: Boolean binary functions

A TTFF B TFTF	Definition	Expression			Description 1	Description 2
TTTT	$A \vee \neg A$		$\top$		1. Tautology	One function
TTTF	$A \vee B$	A	$\mid$	B	Disjunction	OR
TTFT	$A \vee \neg B$	A	$\leftarrow$	B	2. Implication	Subjunction
TTFF	A				1. Identity	
TFTT	$\neg A \vee B$	A	$\rightarrow$	B	1. Implication	Subjunction
TFTF	B				2. Identity	
TFFT	$(A \wedge B) \vee \neg(A \vee B)$	A	$\leftrightarrow$	B	Bijunction	Biconditional
TFFF	$A \wedge B$	A	$\&$	B	Conjunction	AND
FTTT	$\neg(A \wedge B)$	A	$\uparrow$	B	Negate-Conjunction	NAND
FTTF	$\neg(A \wedge B) \wedge (A \vee B)$	A	$\otimes$	B	Antivalence	XOR
FTFT	$\neg B$				2. Negation	
FTFF	$A \wedge \neg B$	A	$\nrightarrow$	B	1. Difference	Nonimplication
FFTT	$\neg A$				1. Negation	
FFTF	$\neg A \wedge B$	A	$\nleftarrow$	B	2. Difference	Converse nonimplication
FFFT	$\neg(A \vee B)$	A	$\downarrow$	B	Negate-Disjunction	NOR
FFFF	$\neg(A \vee \neg A)$		$\bot$		2. Tautology	Zero function

Note: Subjunction equals to the phrase "If A, then B"

1.1 Commutative law

$$A \wedge B \Leftrightarrow B \wedge A$$
$$A \vee B \Leftrightarrow B \vee A$$

1.2 Assoziative law

$$A \wedge (B \wedge C) \Leftrightarrow (A \wedge B) \wedge C$$
$$A \vee (B \vee C) \Leftrightarrow (A \vee B) \vee C$$

1.3 Distributive law

$$A \wedge (B \vee C) \Leftrightarrow (A \wedge B) \vee (A \wedge C)$$
$$A \vee (B \wedge C) \Leftrightarrow (A \vee B) \wedge (A \vee C)$$

1.4 Identity laws

$$A \wedge \mathtt{T} \Leftrightarrow A$$
$$A \vee \mathtt{F} \Leftrightarrow A$$

1.5 Zero / One laws

$$A \wedge \mathtt{F} \Leftrightarrow \mathtt{F}$$
$$A \vee \mathtt{T} \Leftrightarrow \mathtt{T}$$

1.6 Complementary laws

$$A \wedge \neg A \Leftrightarrow \mathtt{F}$$
$$A \vee \neg A \Leftrightarrow \mathtt{T}$$

1.7 Idempotence laws

$$A \wedge A \Leftrightarrow A$$
$$A \vee A \Leftrightarrow A$$

1.8 Merging laws

$$A \wedge (A \vee B) \Leftrightarrow A$$
$$A \vee (A \wedge B) \Leftrightarrow A$$

1.9 Other notations

$$A \wedge B \Leftrightarrow A * B \Leftrightarrow A{\cdot}B \Leftrightarrow AB$$
$$A \vee B \Leftrightarrow A + B$$