

studyguide

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1 Chapter 1

1.1 Propositional Logic

1.1.1 Converse Contrapositive and Inverse ($p \rightarrow q$)

- Converse

$$- q \rightarrow p$$

- Contrapositive

$$- q \rightarrow \neg p$$

- Inverse

$$- \neg p \rightarrow \neg q$$

1.2 Applications of Propositional Logic

1.2.1 Examples of turning sentences into propositional Logic.

1.3 Propositional Equivalences

1.3.1 Logical Equivalences

$p \wedge T$	p	Identity Laws
$p \vee F$	p	
$p \vee T$	T	Domination Laws
$p \wedge F$	F	
$p \vee p$	p	Idempotent Laws
$p \wedge p$	p	
$\neg(\neg p)$	p	Double Negation Laws
$p \vee q$	$q \vee p$	Commutative Laws
$p \wedge q$	$q \wedge p$	
$(p \vee q) \vee r$	$p \vee (q \vee r)$	Associative Laws
$(p \wedge q) \wedge r$	$p \wedge (q \wedge r)$	
$p \vee (q \wedge r)$	$(p \vee q) \wedge (p \vee r)$	Distributive Laws
$p \wedge (q \vee r)$	$(p \wedge q) \vee (p \wedge r)$	
$\neg(p \wedge q)$	$\neg p \vee \neg q$	De Morgans Laws
$\neg(p \vee q)$	$\neg p \wedge \neg q$	
$p \vee (p \wedge q)$	p	Absorption Laws
$p \wedge (p \vee q)$	p	
$p \vee \neg p$	T	Negation Laws
$p \wedge \neg p$	F	

1.3.2 Logical Equivalences Involving Conditional Statements

$p \rightarrow q$	$\neg p \vee q$
$p \rightarrow q$	$\neg q \rightarrow \neg p$
$p \vee q$	$\neg p \rightarrow q$
$p \wedge q$	$\neg(p \rightarrow q)$
$\neg(p \rightarrow q)$	$p \wedge q$
$(p \rightarrow q) \wedge (p \rightarrow r)$	$p \rightarrow (q \wedge r)$
$(p \rightarrow r) \wedge (q \rightarrow r)$	$(p \vee q) \rightarrow r$
$(p \rightarrow q) \vee (p \rightarrow r)$	$p \rightarrow (q \vee r)$
$(p \rightarrow r) \vee (q \rightarrow r)$	$(p \wedge q) \rightarrow r$

1.3.3 Logical Equivalences Involving Biconditional Statements

$p \leftrightarrow q$	$(p \rightarrow q) \wedge (q \rightarrow p)$
$p \leftrightarrow q$	$\neg p \leftrightarrow \neg q$
$p \leftrightarrow q$	$(p \wedge q) \vee (\neg p \wedge \neg q)$
$\neg(p \leftrightarrow q)$	$p \not\leftrightarrow q$

1.4 Predicates and Quantifiers

1.4.1 Quantifiers

- Universal Quantifier

- $\forall(x) P(x)$
- \exists
- \emptyset

- 1.5 Nested Quantifiers
- 1.6 Rules of Inference
- 1.7 Introduction to Proofs
- 1.8 Proof methods and Strategy

2 Chapter 2

- 2.1 Sets
- 2.2 Set Operations
- 2.3 Functions
- 2.4 Sequences and Summations
- 2.5 Cardinality of Sets
- 2.6 Matrices

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