# MACM 101 Lecture 1.2 - Inference and Valid Augmentation

Alexander Ng

September 13, 2024

Prove that $xor \equiv (\iff)$
exercise for the reader

## 1 Review (Propositional Identities)

$$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r) \tag{1}$$

$$p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r) \tag{2}$$

These two identities are known as the **Distributive Laws**
They come in a pair because of "Duality" (Research me)
*Memorize all of the identities from C1.1 Lecture Slides p.90

### 1.1 Prove that XOR is Equivalent to IFF

...

## 2 Logical Implication and Valid Arguments

if $p \implies q$ and $q \implies p$, then $pq$
*No logic puzzles on the exam

# 3 Normal Forms

A system in which expressions of a formal language can be transformed according to a finite set of *rewrite rules* is called a reduction system.

In Mathematics, computer science and logic, rewriting covers a wide range of methods of replacing subterms of a formula with other tierms.

In abstract rewriting, an object is in

## 3.1 CNF and DNF

Conjunctive Normal Form (CNF) is a conjunction of one or more clauses, where a clause is a disjunction of literals. It is an AND of ORs.

Stated formally, if $A, \rightarrow$ is an abstract writing system, some $x \in A$ is in normal form if no $y \in A$ exists such that $x \rightarrow y$.

Example:

$$(a \wedge \neg b) \vee c \tag{3}$$

*Define ”vacuously true” and ”trivially true” (proofs ???)

Stopped at Page 129. Read the entire fucking thing please.