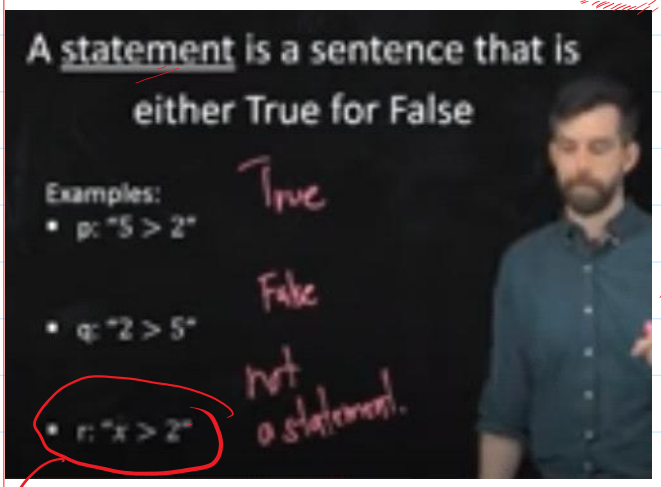
Discrete Mathematics

Monday, August 22, 2022 4:49 PM



Not statement because there's no content

Notation

$\sim$ → Not true | $\wedge$ – And | $\vee$ or

My shirt is gray but shorts are not.

p $\sim$q

$p \wedge \sim q$

Def: Two statements are logically equivalent if they have the same truth table

Def: A tautology t is a statement that is always true

Def: A contradiction c is a statement that is always false

Truth Table for $((\sim p) \vee (\sim q))$

p	q	$\sim p$	$\sim q$	$\sim p \vee \sim q$
T	T	F	F	F
T	F	F	T	T
F	T	T	F	T
F	F	T	T	T

$\sim(p \vee q) \equiv (\sim p) \wedge (\sim q)$?

$\rightarrow \overline{(p \vee q)} = \overline{p} \cap \overline{q}$

$(\sim(p \vee \sim q)) \wedge t$

$\equiv (\sim p \wedge \sim(\sim q)) \wedge t$ Via DeMorgan's

$\equiv (\sim p \wedge q)) \wedge t$ Via Double Negative

$\equiv \sim p \wedge q$ Via Identity

conditional statement

same

Conditional statement mean

Same

Def: $p \to q$ means:
"if p is TRUE then q is TRUE"

p	q	$p \to q$	$\sim p$	$\sim p \vee q$
T	T	T	F	T
T	F	F	F	F
F	T	T	T	T
F	F	T	T	T

If I study hard, I'll pass

If $p \to q$

As p is already F, Nothing to check, so T

When the hypothesis is false, the statement is vacuously true.

Either there I don't study hard, or I will pass

$\sim p \vee q$

Negating a conditional:

$\sim(p \to q) \equiv \sim(\sim p \vee q)$

$\equiv (\sim\sim p \wedge \sim q)$ De Morgan's

$\equiv p \wedge \sim q$

$(\bar{P} \cup \bar{Q})$

$P \cap \bar{Q}$

Contrapositive of a conditional:
$p \to q \equiv \sim q \to \sim p$

$\sim p \vee q \equiv q \vee \sim p$

If I study hard, then I will pass $p \to q$

Either I didn't study hard, or I pass $\sim p \vee q$

If I don't pass, then I didn't study hard $\sim q \to \sim p$

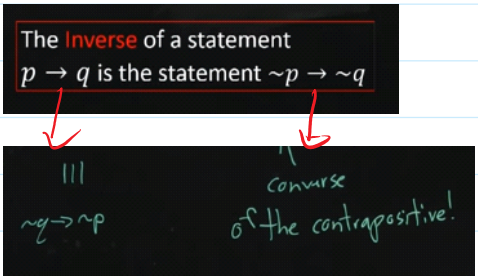
Either I pass, or I didn't study hard $q \vee \sim p$

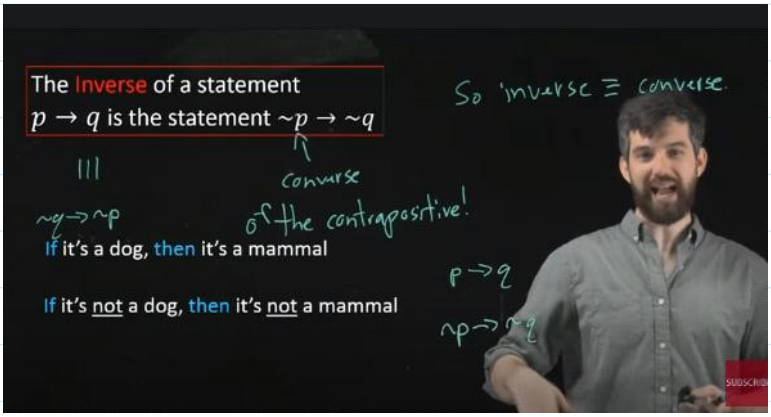
3:53 / 4:59

All are exactly same

The Converse of a statement
$p \to q$ is the statement $q \to p$

But not logically equivalent


The Inverse of a statement
$p \rightarrow q$ is the statement $\sim p \rightarrow \sim q$
converse
of the contrapositive!


The Inverse of a statement
$p \rightarrow q$ is the statement $\sim p \rightarrow \sim q$
So 'inverse' ≡ converse.
converse
of the contrapositive!
If it's a dog, then it's a mammal
If it's not a dog, then it's not a mammal

Hello

Tuesday, August 23, 2022 1:38 AM

This is good