

Logic (PH133): Lecture 5

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1. Not Or

Reading: §3.7

A	B	$A \vee B$	$\neg(A \vee B)$	$\neg A$	$\neg B$	$\neg A \vee \neg B$
T	T	T	F	F	F	F
T	F	T	F	F	T	T
F	T	T	F	T	F	T
F	F	F	T	T	T	T

2. I Met a Philosopher

Reading: §9.2, §9.3, §9.5

3. All Squares Are Blue

Reading: §9.2, §9.3, §9.5

4. Vegetarians Are Evil

Reading: §9.2, §9.3, §9.5

$\forall x (\text{Evil}(x) \rightarrow \text{HatesMeat}(x))$
$\forall x (\text{HatesMeat}(x) \rightarrow \text{Vegetarian}(x))$
$\forall x (\text{Vegetarian}(x) \rightarrow \text{Evil}(x))$

5. Counterexamples with Quantifiers

	Evil(x)	HatesMeat(x)	Vegetarian(x)
Ayesha	no	no	yes

6. What does '→' mean?

Reading: §7.1

Assuming that the rules of Fitch are such that it is impossible to prove an argument which is not logically valid, the truth table for \rightarrow is fixed if we accept \rightarrow Elim and \rightarrow Intro.

How do the rules of proof for \rightarrow fix its truth table?

?	1. $A \rightarrow B$
T	2. A
F	3. B
	\rightarrow Elim: 1,2

A	B	$A \rightarrow B$
T	T	?
T	F	?
F	T	?
F	F	?

7. Not If

If she has seen it, I am dead.

$A \rightarrow B$

That's not true.

$\neg(A \rightarrow B)$

If she has seen it, I am not dead.

$A \rightarrow \neg B$

A	B	$A \rightarrow B$	$\neg(A \rightarrow B)$	$A \rightarrow \neg B$
T	T	T	F	F
T	F	F	T	T
F	T	T	F	T
F	F	T	F	T

8. \leftrightarrow : truth tables and rules

A	B	$A \leftrightarrow B$
T	T	T
T	F	F
F	T	F
F	F	T

Biconditional Elimination (\leftrightarrow Elim)

$P \leftrightarrow Q$ (or $Q \leftrightarrow P$)	
\vdots	
P	
\vdots	
$\triangleright Q$	

Biconditional Introduction (\leftrightarrow Intro)

P	
\vdots	
Q	
\vdots	
P	
$\triangleright P \leftrightarrow Q$	

9. What does \forall mean?

Reading: §9.4

We give the meaning of \forall by specifying what it takes for a sentence containing \forall to be true:

1. Give every object a name.

2. For each name in turn, create a new sentence like this: delete the quantifier and replace all instances of the variable it binds with that name.

3. If ALL of the new sentences are true, so is the original sentence.

10. Does 'if' mean what ' \rightarrow ' means?

Reading: §7.3

These two arguments are valid: does that mean that 'if' means what ' \rightarrow ' means?

$\neg A \vee B$	America does not exist \vee Baudrillard is wrong
If A, B	If America exists, Baudrillard is wrong

If A, B	If you love logic, things will fall into place
$\neg(A \wedge \neg B)$	Not both: you take logic and things don't fall into place

The English argument isn't valid; the FOL argument is valid; therefore 'if' can't mean what ' \rightarrow ' means?

$\neg A$	Marnie will not miss her train
$A \rightarrow B$	If Marnie misses her train, she will arrive on time.

11. Translation with Quantifiers

Reading: §9.5, §9.6

All discordians weep:

$\forall x (Dscrdn(x) \rightarrow Wps(x))$

All **French** discordians weep:

$\forall x ((Frnch(x) \wedge Dscrdn(x)) \rightarrow Wps(x))$

All French discordians weep **and** wail:

$\forall x ((Frnch(x) \wedge Dscrdn(x)) \rightarrow (Wps(x) \wedge Wls(x)))$

All French discordians weep and wail **except Gillian Deleude**:

$\forall x ((Frnch(x) \wedge Dscrdn(x) \wedge \neg(x=a)) \rightarrow (Wps(x) \wedge Wls(x)))$