What We Have Learned So Far about the **SEMANTICS** of Propositional Logic

How to evaluate a formula **relative to ONE Valuation**

How to evaluate a formula **relative to ALL valuations**

Can we get an account of (deductively) **valid argument**?

Deductively Valid Arguments

Informally speaking, an *argument* is said to be **deductively valid**

if and only if

whenever **the premises** are **true**, the **conclusion** is **always true**.

Given the semantics of propositional logic, an *argument* is said to be **deductively valid**

if and only if

whenever **all** valuations that make **true** the **premises** make **true** the **conclusion**.

Recall Modus Ponens

Premise 1: If you take the medication, then you will get better
Premise 2: You are taking the medication

Conclusion: You will get better

Modus Ponens:

If ***p***, then ***q***
p

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q

Is Modus Ponens Valid?

p	$(p$	$\rightarrow$	$q)$	q
1	1	**1**	1	**1**
1	1	**0**	0	**0**
0	0	**1**	1	**1**
0	0	**1**	0	**0**

Is Modus Ponens Valid?

p	$(p$	$\rightarrow$	$q)$	q
1	1	1	1	1
1	1	0	0	0
0	0	1	1	1
0	0	1	0	0

We only need to check the first line of the table because this is where the premises are all true.

We can write

$$p, p \rightarrow q \vDash q$$

Recall Modus Tollens

Premise 1: If you take the medication, then you will get better
Premise 2: You are NOT getting better

Conclusion: You are NOT taking the medication

Modus Tollens:

If ***p***, then ***q***
not-q

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not-p

Modus Tollens:

$p \rightarrow q$
$\neg q$

$\neg p$

Is Modus Tollens Valid?

$\neg q$	$(p$	$\rightarrow$	$q)$	$\neg p$
$\mathbf{0}$	1	$\mathbf{1}$	1	$\mathbf{0}$
$\mathbf{1}$	1	$\mathbf{0}$	0	$\mathbf{0}$
$\mathbf{0}$	0	$\mathbf{1}$	1	$\mathbf{1}$
$\mathbf{1}$	0	$\mathbf{1}$	0	$\mathbf{1}$

Is Modus Tollens Valid?

$\neg q$	$(p$	$\to$	$q)$	$\neg p$
0	1	**1**	1	**0**
1	1	**0**	0	**0**
0	0	**1**	1	**1**
1	0	**1**	0	**1**

We only need to check the last line of the table because this is where the premises are all true.

We can write

$\neg q, p \to q \vDash \neg p$