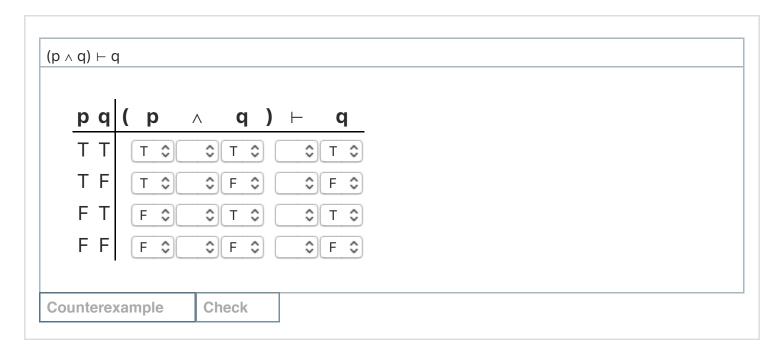
Logic, First Course, Winter 2020. Week 3, Section Meeting. Back to course website

# Distinguishing valid from invalid arguments

In section, we focus on distinguishing valid from invalid arguments via a discussion of a series of examples.

#### Example 1

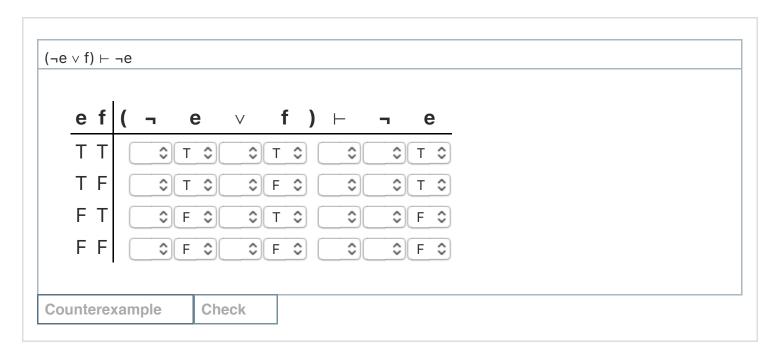
Use the table to assess the validity of the argument:



Hence, is the argument with premise  $p \land q$  and conclusion q a valid argument?

Yes or no?			
OYes.			
○No.			
Check			

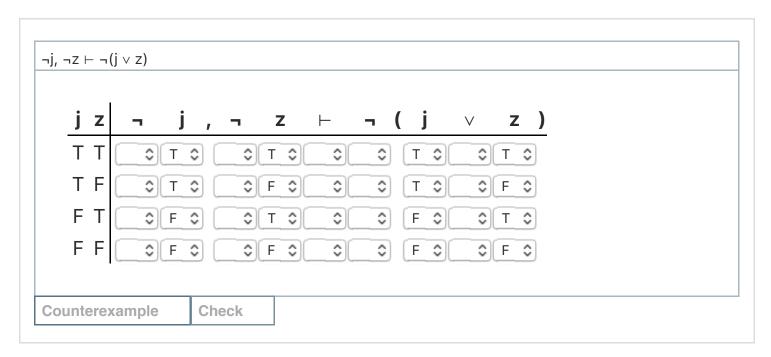
Use the table to assess the validity of the argument:



Hence, is the argument with conclusion  $\neg e$  and premise  $\neg e \lor f$  a valid argument?

Yes or no?			
OYes.			
○No.			
Check			

Use the table to assess the validity of the argument:



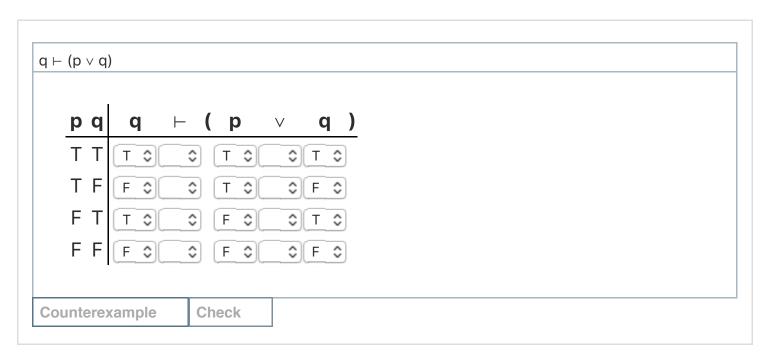
Hence, is the argument with conclusion  $\neg (j \lor z)$  and premises  $\neg j$  and  $\neg z$  a valid argument?

Yes or no?		
OYes.		
○No.		
Check		

One way to quickly assess validity is to see this argument as a valid argument obtained from an equivalence. Which equivalence can this be seen as an instance of? *Hint: the comma separating the premises acts like a conjunction*.

Which is it?	
Olaw of double negation	
Oassociativity	
ODeMorgan	
Odistributivity	
Check	

Use the table to assess the validity of the argument:



Hence, is the argument with conclusion  $p \lor q$  and premise p a valid argument?

Yes or no?			
OYes.			
○No.			
Check			

Consider how large the table would be to assess the validity of the following:

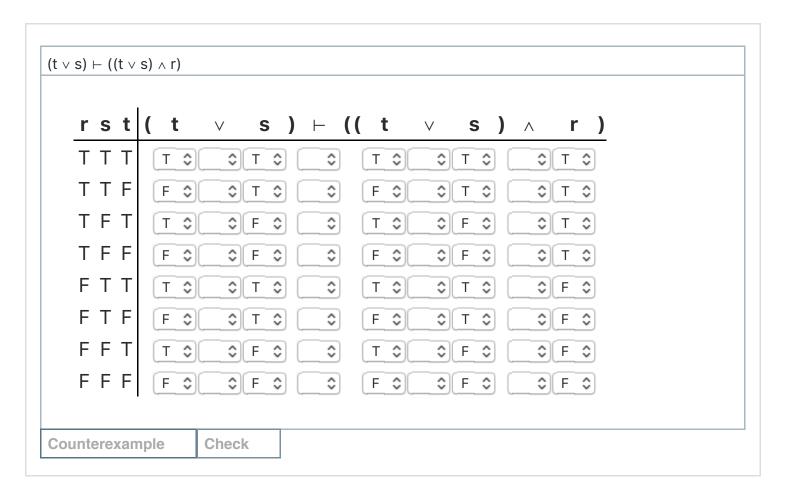
$$r, t \vdash s \lor (r \land t)$$

It turns out that this is a valid argument. What substitution should you do to see this, on the basis of Example 4? Recall Example 4 was the valid argument  $q \vdash p \lor q$ .<sup>1</sup>

○substitute s for p and substitute r/\ t for q.						
Osubstitute t for p and substitute r/\ s for q.						
Osubstitute r∕\ t for p and substitute s for q.						
Osubstitute r/\ s for p and substitute t for q.						

## Example 6

Use the table to assess the validity of the argument, keeping in mind that the initial three columns are ordered alphabetically (i.e. r, s, t):



Hence, is the argument with conclusion  $(t \lor s) \land r$  and premise  $t \lor s$  a valid argument?

Yes or no?			
○Yes.			
○No.			
Check			

Hint: think about t  $\vee$  s as it appears in the premise and as part of the conclusion as a single proposition (like p).

## Example 7

Use the table to assess the validity of the argument:

b	-	а,	( ¬	а	$\rightarrow$	b )	$\vdash$	b
ΤТ	•	T 🗘		T 💸	\$ T	•	<b>○</b> T	\$
ΤF	•	T 🗘	•	T 💸	\$ F	•	\$ F	\$
FΤ	•	F 🗘	•	F 💸	\$ T	•		\$
FF	•	F 🗘	•	F 🗘	<b>♦</b> F	•	<b>♦</b> F	<b>\$</b>

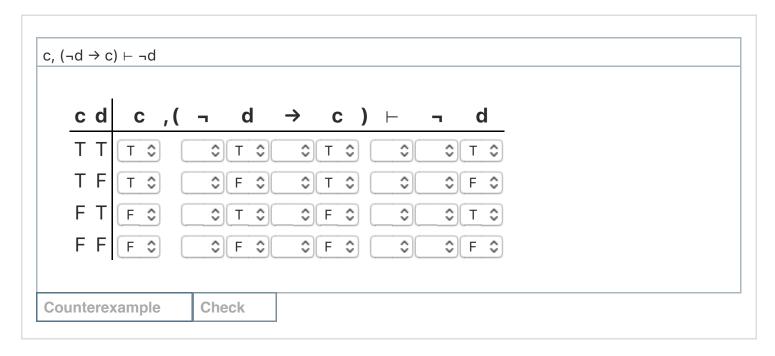
Hence, is the argument with conclusion b and premises  $\neg a$  and  $\neg a \rightarrow b$  a valid argument?

Yes or no?			
OYes.			
○No.			
Check			

Which of the following is this example a substitution-instance of:

Omodus ponens	<b>3</b>	
Omodus tollens		
affirming the c	onsequent	
Odenying the an	itecedent	

Use the table to assess the validity of the argument:



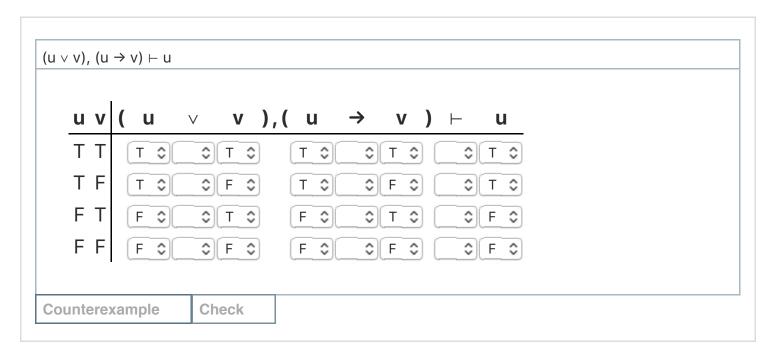
Hence, is the argument with conclusion  $\neg d$  and premises c and  $\neg d \rightarrow c$  a valid argument?

Yes or no?			
OYes.			
○No.			
Check			

Which of the following is this example a substitution-instance of:

Which is it?					
Omodus ponens.					
Omodus tollens.					
Oaffirming the consequent.					
Odenying the antecedent.					
Check					

Use the table to assess the validity of the argument:



Hence, is the argument with premises  $u \vee v$  and  $u \rightarrow v$  and conclusion u a valid argument?

Yes or no?			
OYes.			
○No.			
Check			

Consider how large the table would be to assess the validity of the following:

$$c \wedge (d \wedge e) \vdash e$$

It turns out this argument is valid. One way to see it is to answer the following question:

What is the one circumstance in which  $c \wedge (d \wedge e)$  is true?

Which is i	t?
Owhen	n exactly one of the propositional letters is true.
Owhen exactly two of the propositional letters are true.	
Owhen	all three of the propositional letters are true.
Check	

Another way to discern the validity of the argument is to "chain together" the following two valid arguments:

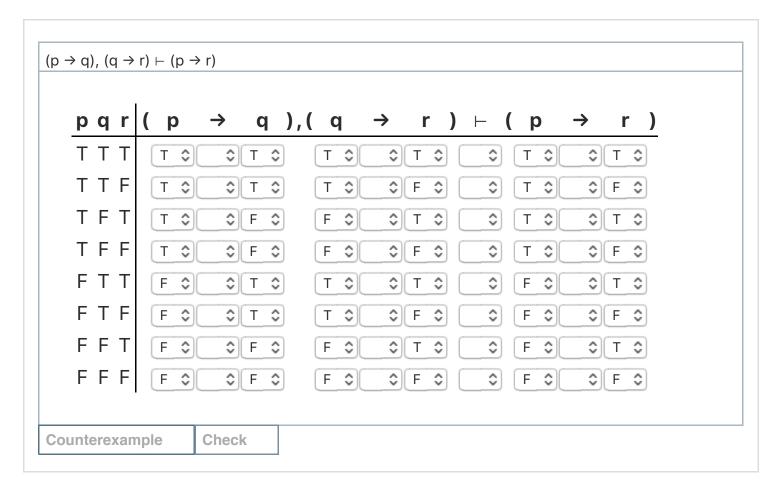
$$c \wedge (d \wedge e) \vdash d \wedge e \text{ and } d \wedge e \vdash e$$

The second validity  $d \land e \vdash e$  is clearly a substitution-instance of Example 1 (which recall said that  $p \land q \vdash q$ ).

But what substitution do you have to do to see that the first validity  $c \land (d \land e) \vdash d \land e$  is a substitution-instance of Example 1? Recall again Example 1 said that that  $p \land q \vdash q$ .

Which is it?	
Osubstitute d for q, and substitute c/\ e for p.	
Osubstitute c for p, and substitute d/\ e for q.	
Osubstitute d for p, and substitute c/\ e for q.	
Osubstitute c for q, and substitute d/\ e for p.	
Check	

Use the table to assess the validity of the argument (this validity undergirds the "chaining" we mentioned in the previous example).



Hence, is the argument with premises  $p \to q$  and  $q \to r$  and conclusion  $p \to r$  a valid argument?

Yes or no?		
○Yes.		
○No.		
Check		

Here is another way to think about the validity from the previous example:

$$p \rightarrow q, q \rightarrow r \vdash p \rightarrow r$$

What is the one circumstance in which the conclusion  $p \rightarrow r$  is false?

Owhen p is true and r is true.		
Owhen p is true and r is false.		
Owhen p is false and r is true.		
Owhen p is false and r is false.		

In this circumstance you just described, if q is true then premise  $q \to r$  is false; and in this circumstance if q is false then  $p \to q$  is false. Hence, in either case, one of the two premises is false. Hence, in the circumstance where the conclusion  $p \to r$  is false, at least one of the premises is false.

The argument we just gave in the previous paragraph is an example of one of the valid arguments we saw in lecture.

Which is it?	
Odisjunctive syllogism.	
Omodus ponens.	
Oreasoning by cases.	
Omodus tollens.	
Check	

These are section notes written for this course.<sup>2</sup>

- Note that there was a typo in an earlier posted version of these section notes and that the first option was the same as the third option, and the second was the same as the fourth option.
- 2. It is run on the Carnap software, which is ←

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