

Philosophy 201: Precept 2

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One of the inference rules that we can use in proofs is the following:

Rule of Assumptions (A): Any proposition may be introduced at any stage of a proof. We write to the left the number of the line itself.

Rule of Theorem Introduction (TI(T)): Any theorem (or substitution instance of a theorem) already proved may be introduced at any stage of a proof. At the right, we cite TI(T) (or SI(S) if a substitution instance) together with the number of the theorem proved. Theorems do not depend on any assumptions and so no numbers appear on the left.

Translate 1-5 into propositional form. (We are not yet using quantifiers, predicates, or functions.)

1. Mark Twain wrote *Huckleberry Finn* as well as *Tom Sawyer*.
2. Samuel Clemens wrote *Huckleberry Finn* but he did not write *Crime and Punishment*.
3. Either the author of *Crime and Punishment* and *Notes from the Underground* wrote *Tom Sawyer*, or else he wrote *The Brothers Karamazov*.
4. It's simply not the case that if Sadie is wrong then it's because she doesn't think logically.
5. If neither rain nor snow nor sleet nor hail will prevent me from putting this letter in your mailbox, then if I am neither a postal worker nor a sociopath, then I must just be a good friend.
6. The ground is wet (w) only if it rained (r). $w \rightarrow r$
7. The ground is wet if it rained. $r \rightarrow w$
8. The ground is wet if and only if (iff) it rained. $w \leftrightarrow r$
9. People cannot ride the roller coaster (r) unless they're older than 16 (o). $\sim o \rightarrow \sim r$. 'Unless' means if not.
10. People cannot ride the roller coaster unless they're older than 16, but some people who are older than 16 don't ride. $(\sim o \rightarrow \sim r) \wedge (o \wedge \sim r)$

For each of the following: Determine if they are valid or not. If they are, prove it (using only what we've learned so far). If not, provide a counterexample.

1. $p \wedge q \vdash p \vee q$

2. $p \vee q \vdash p \wedge q$

3. $(p \rightarrow q) \wedge (p \rightarrow r), p \vdash q \wedge r$

4. $p \rightarrow q \vdash \sim q \rightarrow \sim p$

5. $p \rightarrow q, \sim r \rightarrow \sim q, p \vdash r$

6. $p \rightarrow \sim (q \vee r) \vdash q \rightarrow \sim p$

7. $(p \wedge q) \wedge r \vdash p \wedge (q \wedge r)$

8. $p \rightarrow q, q \vdash p$

9. $p \rightarrow (q \rightarrow r), \sim r \vdash p \rightarrow \sim q$

10. $\sim (p \rightarrow q) \vdash \sim q$

11. $p, \sim p \vdash q$