

Hmwk 11: pp.139-134: 9a-d; 10 (choose any 3); 11; 13ai; 13bi

(9b)

1. p
2. $\neg r$
3. $(p \ \& \ \neg r)$ conj.1,2
4. $(p \ \& \ \neg r) \rightarrow q$
5. $\therefore q$ 3,4: Modus Ponens

Notes: Modus Ponens says that given $P \rightarrow Q$ and P , then Q .

Since $p, \neg r$, then $(p \ \& \ \neg r)$.

Therefore, by Modus Ponens, q .

(9c)

1. $p \vee q$
2. $\neg q$
3. $r \rightarrow \neg p$
4. $q \vee p$ commutativity on 1
5. p Disjunctive syllogism on 4, 2
6. $\sim\sim p$ 5, double negative
7. $\therefore \neg r$ Modus Tollens on 3, 6

Note: step 5 \rightarrow 6 is crucial. MT needs a statement of the form $\sim P$, so we need to translate p into a negated proposition, via $\sim\sim p$.

(10)

Notes:

How do we show an argument to be **not valid**?

Find an assignment of truth values to atomic formulas such that the premises are true and the conclusion is false.

e.g.

After (10e):

1. $(x \rightarrow y)$
2. $(\neg x \rightarrow z)$
3. $(y \vee z) \rightarrow (c \ \& \ s)$
4. $(c \rightarrow (s \rightarrow t))$
5. $(t \rightarrow (x \rightarrow p))$
6. $\therefore (z \ \& \ p)$

To show this is false, we find some assignment of truth values so all the propositions 1-5 are true, but 6 is false.

- Assume x,y,c,s,t,p are true but z is false.

- 1-5 are all true. (2 comes out as $(0 \rightarrow 0)$, which is 1).

- But 6 is false: $0 \ \& \ 1 = 0$.

So, it's invalid.