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

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

(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.