

Thursday and Friday tutorial groups: HAND IN solutions at your next tutorial (in week 5). Monday and Wednesday groups: you need NOT hand in solutions.

Prove the following, using the rules A, &I, &E, MPP, CP, DN, MTT, vI and vE. Note that the rule RAA is not to be used for these proofs.

- ✓ 1. $\neg(P \& Q) \vdash \neg(Q \& P)$
- ? 2. $P \rightarrow \neg Q \vdash Q \rightarrow \neg P$
- ✓ 3. $(P \vee Q) \rightarrow R \vdash (P \rightarrow R) \& (Q \rightarrow R)$
- ? 4. $(P \& Q) \rightarrow \neg R \vdash R \rightarrow (P \rightarrow \neg Q)$
- ? 5. $P, Q \vee R \vdash (P \& Q) \vee (P \& R)$
6. $P \rightarrow (Q \vee R), Q \rightarrow R \vdash P \rightarrow R$
- ✓ 7. $P \rightarrow R, Q \rightarrow S \vdash (P \vee Q) \rightarrow (R \vee S)$ ✓
8. $P, \neg P \vdash Q$

The above constitute sheet E3 for LEMMON-AID. Sheets S3 and X3 can be used as practice, as they contain more sequents of the same general kind.