

Here are some more simple practice derivations. Do not use any theorems:

1. From  $\Gamma \vdash p$  to  $\Gamma \vdash q \supset p$  (Hint: you can add anything you want to the datum of a sequent).

2. From  $\Gamma \vdash r$  and  $\Delta \vdash \neg r$  to  $\Gamma, \Delta \vdash s$  (Hint: you can add anything you want to the datum of a sequent).

3. From  $\Gamma \vdash s$  to  $\Gamma \vdash \neg\neg s$  (Hint: assume  $\neg s$ ) .

4. From  $\Gamma \vdash \neg\neg p \supset q$  to  $\Gamma \vdash p \supset q$  (Hint: part of the derivation adapts the previous one).

5. From  $\Gamma \vdash \neg\neg p \supset \neg\neg q$  to  $\Gamma \vdash p \supset q$  (Hint: adapt the previous two derivations).

6. From  $\Gamma \vdash \neg\neg s \vee w$  to  $\Gamma \vdash s \vee w$  (Hint:  $\vee E$  is your friend and don't forget about  $\vee I$ ).

7. From  $\Gamma \vdash p \wedge (q \wedge r)$  to  $\Gamma \vdash (p \wedge r) \wedge q$  (Hint: you only need  $\wedge E$  and  $\wedge I$ ).

8. From  $\Gamma \vdash (p \vee q) \vee r$  to  $\Gamma \vdash q \vee (p \vee r)$  (Hint: apart from assumptions, you only need  $\vee I$  and  $\vee E$ ).

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