

Prove the following derivability judgments:

$$1) p \rightarrow (q \rightarrow r), p, \neg r \vdash \neg q$$

$$2) p \wedge q \rightarrow r \vdash p \rightarrow (q \rightarrow r)$$

$$3) (a \rightarrow c) \vee (b \rightarrow c), a, b \vdash c$$