

$$\begin{array}{c}
\frac{}{\Gamma \vdash \neg P \vee \neg Q} \text{ax} \\
\frac{\frac{\frac{}{\neg P, \Gamma \vdash P \wedge Q} \text{ax}}{\neg P, \Gamma \vdash P} \wedge_{eg} \quad \frac{\frac{}{\neg Q, \Gamma \vdash P \wedge Q} \text{ax}}{\neg Q, \Gamma \vdash Q} \wedge_{ed}}{\neg P, \Gamma \vdash \neg P \quad \neg Q, \Gamma \vdash \neg Q} \neg_e \\
\frac{\neg P, \Gamma \vdash \perp \quad \neg Q, \Gamma \vdash \perp}{\Gamma = P \wedge Q, \neg P \vee \neg Q \vdash \perp} \vee_e \\
\frac{\Gamma = P \wedge Q, \neg P \vee \neg Q \vdash \perp}{\neg P \vee \neg Q \vdash \neg(P \wedge Q)} \neg_i
\end{array}$$