

$$\frac{p, q}{p \wedge q} I_{\wedge}$$

$$\frac{p \wedge q}{p} E_{\wedge}$$

$$\frac{a \vee b}{\begin{array}{|l} a \\ \vdots \\ c \end{array}} \leftarrow \text{anything}$$

$$\frac{\begin{array}{|l} b \\ \vdots \\ c \end{array}}{c}$$

$$\frac{p \wedge q}{q} E_{\wedge}$$

$$\frac{a}{a \vee b} I_{\vee}$$

\uparrow anything

$$\begin{array}{l} 1 \\ 2 \\ 3 \end{array} \frac{a \rightarrow b}{a}{b} \quad E_{\rightarrow}(1,2) \text{ or } MP$$

$$\frac{a}{\begin{array}{|l} \vdots \\ b \end{array}}{a \rightarrow b} I_{\rightarrow}$$

$$\begin{array}{l} 1 \\ 2 \end{array} \frac{a}{\perp} \quad \neg a \quad I_{\neg}(1,2)$$

$$\begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \end{array} \frac{b}{\begin{array}{|l} a \\ \neg b \\ \perp \end{array}} \quad E_{\neg}(1,3)$$