

Try it!

Given: $p \vee q, (r \wedge s) \rightarrow \neg q, r$.
Show: $s \rightarrow p$

$$\text{Eliminate } \wedge \frac{A \wedge B}{\therefore A, B}$$

$$\text{Eliminate } \vee \frac{A \vee B, \neg A}{\therefore B}$$

$$\text{Intro } \wedge \frac{A; B}{\therefore A \wedge B}$$

$$\text{Intro } \vee \frac{A}{\therefore A \vee B, B \vee A}$$

$$\text{Direct Proof rule} \frac{A \Rightarrow B}{A \rightarrow B}$$

$$\text{Modus Ponens} \frac{P \rightarrow Q; P}{\therefore Q}$$

You can still use all the propositional logic equivalences too!

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Inference Rules

$$\boxed{\text{Eliminate } \wedge} \frac{A \wedge B}{\therefore A, B}$$

$$\boxed{\text{Eliminate } \vee} \frac{A \vee B, \neg A}{\therefore B}$$

$$\boxed{\text{Intro } \wedge} \frac{A; B}{\therefore A \wedge B}$$

$$\boxed{\text{Intro } \vee} \frac{A}{\therefore A \vee B, B \vee A}$$

$$\boxed{\text{Direct Proof rule}} \frac{A \Rightarrow B}{A \rightarrow B}$$

$$\boxed{\text{Modus Ponens}} \frac{P \rightarrow Q; P}{\therefore Q}$$

You can still use all the propositional logic equivalences too!

$$\boxed{\text{Intro } \exists} \frac{P(c) \text{ for some } c}{\therefore \exists x P(x)}$$

$$\boxed{\text{Eliminate } \exists} \frac{\exists x P(x)}{\therefore P(c) \text{ for a fresh } c}$$

$$\boxed{\text{Eliminate } \forall} \frac{\forall x P(x)}{\therefore P(a) \text{ for any } a}$$

$$\boxed{\text{Intro } \forall} \frac{P(a); a \text{ is arbitrary}}{\therefore \forall x P(x)}$$

$$\boxed{\text{Excluded Middle}} \frac{}{\therefore A \vee \neg A}$$

$$\boxed{\text{DeMorgan's (Quantifiers)}} \frac{}{\neg(\forall x A) \equiv \exists x(\neg A)} \\ \neg(\exists x A) \equiv \forall x(\neg A)}$$