I'm trying to show that $\vdash P \wedge Q \to P \vee Q$.

Just as a reminder: $P \wedge Q \to P \vee Q$ is short for $((P \wedge Q) \to (P \vee Q))$ according to the Bracketing Conventions.

$P \wedge Q$

Since the sentence to be proved is of the form $\phi \to \psi$, I may hope to get it by $\to$Intro. Thus I assume $P \wedge Q$ and try to obtain $P \vee Q$ from it.

$$\frac{P \land Q}{P}$$

An application of $\land$Elim1 gives us P.

$$\dfrac{\dfrac{P \wedge Q}{P}}{P \vee Q}$$

An application of $\vee$Intro1 gives me $P \vee Q$.

$$\cfrac{\cfrac{\cfrac{[P \land Q]}{P}}{P \lor Q}}{P \land Q \to P \lor Q}$$

Finally I get $P \land Q \to P \lor Q$ by $\to$Intro. The assumption $P \land Q$ is discharged according to $\to$Intro.