

$$\begin{aligned}
\mathbf{d}(p^*, q) &= \top \wedge \mathbf{d}(p^*, q) \\
&= \text{id}_{\mathbf{P}}(p^*, p') \wedge \mathbf{d}(p^*, q) \\
&\leq \bigvee_{p' \in \mathbf{P}} \text{id}_{\mathbf{P}}(p^*, p') \wedge \mathbf{d}(p'^*, q) \\
&= (\text{id}_{\mathbf{P}} \circ \mathbf{d})(p^*, q).
\end{aligned}$$