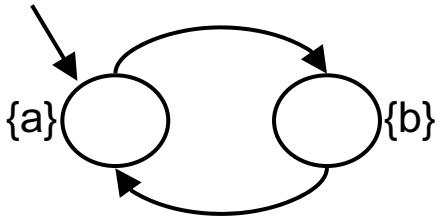
Equivalence rules for LTL

- Duality law

$$\begin{aligned} \neg \bigcirc \varphi &= \bigcirc \neg \varphi \\ \neg \Diamond \varphi &= \Box \neg \varphi \\ \neg \Box \varphi &= \Diamond \neg \varphi \end{aligned}$$



- Distributive law

$$\begin{aligned} \bigcirc(\varphi \bigcup \psi) &= (\bigcirc \varphi) \bigcup (\bigcirc \psi) \\ \Diamond(\varphi \vee \psi) &= \Diamond \vee \bigcup \Diamond \psi \\ \Box(\varphi \wedge \psi) &= \Box \varphi \wedge \Diamond \psi \end{aligned}$$

$$\Diamond(a \wedge b) \stackrel{?}{\equiv} \Diamond a \wedge \Diamond b$$

- Expansion law

$$\begin{aligned} \varphi \bigcup \psi &= \psi \vee (\varphi \vee \bigcirc(\varphi \bigcup \varphi) \\ \Diamond \varphi &= \varphi \vee \bigcirc \Diamond \varphi \\ \Box \varphi &= \varphi \wedge \bigcirc \Box \varphi \end{aligned}$$

- .....