

$$\begin{aligned}
\mathbf{F}\varphi &\stackrel{\mathbf{n}}{=} true \mathbf{U} \varphi \\
&\stackrel{\mathbf{dsc}}{=} true \mathbf{U} (\varphi \wedge (true \vee sing)) \\
&= true \mathbf{U} (\varphi \wedge sing) \\
&\stackrel{\mathbf{t}}{=} true \mathbf{U} (\boxed{\varphi} \wedge sing \wedge alive)
\end{aligned}$$