Van Dalen Exercise 3.1.2(a-e).

2(a)

$$\dfrac{\phi \qquad \dfrac{[-\phi \,\&\, \psi]1}{-\phi}}{\dfrac{\_|\_}{-(-\phi \,\&\, \psi)}\,1}$$

2(b)

$$\dfrac{\dfrac{[-\psi]1 \qquad \phi}{\phi \,\&\, -\psi} \qquad -(\phi \,\&\, -\psi)}{\dfrac{\_|\_}{\psi}\,1}$$

2c

$$\dfrac{\dfrac{-\phi \qquad [\phi]1}{\dfrac{\_|\_}{-\phi}\,1}}{(\phi \longrightarrow \psi) \longrightarrow -\phi} \qquad \dfrac{\dfrac{[\phi]2 \qquad [-\phi]3}{\dfrac{\_|\_}{\psi}\,2}}{-\phi \longrightarrow (\phi \longrightarrow \psi)}\,3$$

$$(\phi \longrightarrow \psi) \longleftrightarrow -\phi$$

2d

$$\begin{array}{c} D \\ \phi \end{array} \quad \Rightarrow \quad \dfrac{\begin{array}{c} D \\ \phi \end{array}}{\psi \longrightarrow \phi}$$

2e

$$\dfrac{\dfrac{-\phi \qquad [\phi]1}{\dfrac{\_|\_}{\psi}}\,1}{\phi \longrightarrow \psi}$$