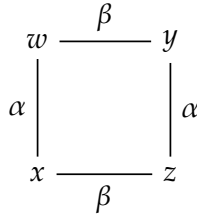


- (1) Check whether the following sentence is valid (i.e. true in all possibilities) or not by using the truth-table method.

If-(if- A -then- C)-then-(if-(A -and- B)-then- C).

- (2) In the following partition model of logic of “knows that” (see pp. 6–7 of the *Logic of “Knows That”* chapter slide deck), suppose that the sentence φ is true in the states w and x but not in y or z .



Show that the following sentence is true in the state w :

α knows that β does not know that φ .

- (3) Prove that, in the linear time model of temporal / tense logic (see pp. 17–18 of the *Time and (In/non)determinism* chapter slide deck), the following inference is valid (i.e. the conclusion is true in any moment at which the premise is true):

$\text{Will}_{\text{always}} : \varphi \implies \text{Will}_{\text{always}} : \text{Will}_{\text{always}} : \varphi$.

Provide a proof in the style of the proof on p. 29 of the *Logic of “Knows That”* chapter slide deck. You need to use the following property of the linear time model: If $m_1 \rightarrow m_2$ and $m_2 \rightarrow m_3$ then $m_1 \rightarrow m_3$.