HW3 (Corrections) (CSCI-C241)

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- Question One
  - 1c
    This proof is valid
  - 1e
    This proof is not valid, as they are doing proof by cases, with cases that are part of an implication premise (meaning it's something that they do not have).
- Question Two
  - 2d
    Claim: $(A \wedge B) \rightarrow C, B \vdash (A \wedge \neg D) \rightarrow (C \wedge \neg D)$
    Goal: $(A \wedge \neg D) \rightarrow (C \wedge \neg D)$

    Pf: Assume $(A \wedge B) \rightarrow C, B$.

    1. *Subproof*
    2. Assume $A \wedge \neg D$.
    3. From $A \wedge \neg D$, we can conclude A and $\neg D$. $(\wedge - \mathit{Elimination})$
    3. From A and B, we can conclude $A \wedge B$. $(\wedge - \mathit{Introduction})$
    4. From $A \wedge B$, we can apply $(A \wedge B) \rightarrow C$ and conclude C. $(\mathit{Application})$
    5. From C and $\neg D$, we can conclude $C \wedge \neg D$. $(\wedge - \mathit{Introduction})$
    6. Under the assumption of $A \wedge \neg D$, we proved C and $\neg D$. (Direct Proof)

    □

  - 2g
    Claim: $\vdash (X \wedge (X \rightarrow (Z \wedge Y))) \rightarrow (X \wedge Y)$
    Goal: $(X \wedge (X \rightarrow (Z \wedge Y))) \rightarrow (X \wedge Y)$

    Proof.

    1. *Subproof*
    2. Assume $X \wedge (X \rightarrow (Z \wedge Y))$
    3. From $X \wedge (X \rightarrow (Z \wedge Y))$ we can conclude X and $X \rightarrow (Z \wedge Y)$ $(\wedge - \mathit{Elimination})$
    4. From X we can apply $X \rightarrow (Z \wedge Y)$ and conclude $Z \wedge Y$. $(\mathit{Application})$
    5. From $Z \wedge Y$ we can conclude Y. $(\wedge - \mathit{Elimination})$
    6. From X and Y we can conclude $X \wedge Y$. $(\wedge - \mathit{Introduction})$
    7. Under the assumption $X \wedge (X \rightarrow (Z \wedge Y))$, we proved $(X \wedge Y)$, therefore $(X \wedge (X \rightarrow (Z \wedge Y))) \rightarrow (X \wedge Y)$ (Direct Proof)

    □