QUESTION 1 (5pts) Give a definition and an example of a default reasoning.

QUESTION 2 (20pts total)

1. (4pts) Write the following natural language statement:

   From the fact that it is not necessary that an elephant is not a bird we deduce that:
   it is not possible that an elephant is a bird or, if it is possible that an elephant is a bird, then it is not
   necessary that a bird flies.

   as a formula

   \[ A_1 \in F_1 \text{ of a language } L_{\{\neg, \land, \lor, \Rightarrow\}}, \]

   \[ A_2 \in F_2 \text{ of a language } L_{\{\neg, \land, \lor, \Rightarrow\}}. \]

2. (2pts) Main connective of the formula \( A_1 \) is: \( \), main connective of the formula \( A_2 \) is:
3. (1pts) Degree of the formula $A_1$ is: $\ldots$, degree of the formula $A_2$ is: $\ldots$

4. (2pts) All proper, non-atomic sub-formulas of $A_1$ are: $\ldots$

5. (2pts) All non-atomic sub-formulas of $A_2$ are: $\ldots$


   A Restricted Model:

   Evaluation:

   A Restricted Counter-Model:

   Evaluation:

7. (1pt) There are more than 3 possible restricted counter-models of $A_2$. Justify.
8. (1pts) There are more than 2 possible restricted models of $A_2$. Justify your answer.

9. (2pts) List 3 models and 2 counter-models for $A_2$ by extending the restricted model and the counter-model you have found in 6. to the set $VAR$ of all variables.

10. (1pts) There are possible models for $A_2$.

There are possible counter-models for $A_2$.

QUESTION 2 (EXTRA 5pts) Show that

$$\models (¬((a \cap ¬b) ⇒ ((c ⇒ (¬f \cup d)) \cup e)) ⇒ ((a \cap ¬b) \cap (¬(c ⇒ (¬f \cup d)) \cap ¬e))).$$