Abstract Syntax Trees

In Boolean expressions, ¬ has the highest precedence, followed by ∧ and ∨. With this in mind, write out the ASTs corresponding to each of the following Boolean expressions:

1.) ¬a ∧ b ∨ c

2.) (a ∨ b) ∧ c

3.) ¬(a ∧ b) ∧ (b ∨ c)

Arithmetic expressions can be used to form Boolean expressions with the help of arithmetic comparisons (e.g., <, <=, >, >=, ==). These comparisons have the lowest possible precedence. With this in mind, write out the ASTs corresponding to each of the following expressions:

4.) `1 * 2 + 3 == 4`

5.) `(2 + 2 < 4) ∧ ¬a`

Semantic Tableau

For each of the following Boolean formulas, write out the complete semantic tableau tree. **Circle** the nodes in the tree representing solutions. If a tree has no solutions, say so. **Be sure to write all steps.**

6.) `¬a ∧ a`

7.) (a ∨ ¬a) ∧ a

8.) (¬x ∧ ¬y) ∨ (x ∧ y)

Prolog - Modeling the World

9.a)

For this problem, you need to write a clause database encapsulating pricing information for a convenience store. Write Prolog code accurately reflecting the following:

- Soda costs $2
- Chips cost $3
- Hot dogs cost twice as much as soda (do not hardcode $4)
- Soda chips, and hot dogs are food
- Pencils and pens are office supplies
- All office supplies cost $2
- Cold medicine costs $7

Using the clause database you previously wrote, write queries to determine the following:

9.b.) Which items cost exactly $2?

9.c.) Which items cost more than $3?

9.d.) Which foods cost less than $3?

9.e.) Which foods are also office supplies?